ACHIEVING GOALS

CXIV

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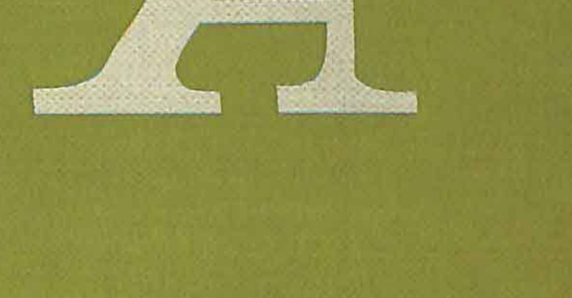

TEACHER'S EDITION — ANNOTATED AND KEYED

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How to Use the TEACHER'S EDITION—Annotated and Keyed
FOR
AMERICAN ARITHMETIC
SECOND EDITION

This Teacher's Edition is designed to be the greatest possible help to the busy teacher. Within one cover, it presents these distinctive features.

1. Pupil's Book. The full text of the pupil's book is printed in black and color exactly as it appears in the book used by the pupil.

2. Annotation. Concise statements of objectives and practical and helpful suggestions to the teacher are overprinted in a distinctive and legible color directly on the pages of the pupil's text.

3. Answers and Keys. Answers to all concrete problems are overprinted in color on the pages of the pupil's text. They are placed in the normal positions or as near to the problem as possible. There is no need for the teacher to work these problems or to turn to an answer section.

The keys to the more involved problems with their answers are given in the Teacher's Guide and Key at the end of the book.

4. Teacher's Guide and Key. For the convenience of the teacher, the Teacher's Guide and Key is printed on tinted paper immediately following the index in the pupil's text. The tinted paper is different enough from the white paper of the pupil's text to assist the teacher in turning easily to guide or key pages. A tint has been used that has been found scientifically easy on the eyes. The pages of the Teacher's Guide and Key are numbered separately with the letter G pointing out that guide and key pages are meant.

The Teacher's Guide and Key provides a full statement of the aims and detailed practical suggestions for each chapter and each page or group of pages in the pupil's text. Following the discussion of the treatment of each page is the key, working the more involved problems in full. References to pages in the workbook AMERICAN WORKSHOP are provided for those teachers using these workbooks. A list of audio-visual aids is provided at the end of the guide.

For advance study in preparation for the class session and for quick reference in the classroom, the Teacher's Edition—Annotated and Keyed offers the teacher all the above in this one volume, very little larger than the pupil's text itself.

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ACHIEVING GOALS

CXIV

American Arithmetic
Second Edition

$A = lw$

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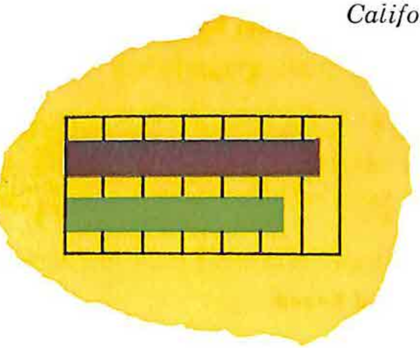

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ACHIEVING GOALS

American Arithmetic, Second Edition

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Covers by John Horton

EP 10 9 8 7 6 5 4 3 2 1

TEACHER'S EDITION—Annotated and Keyed
SL 10 9 8 7 6 5 4 3 2 1

Contents

Chapter		Page
1	Numbers through thousands. The basic number facts with special helps for mastering them. The four processes with whole numbers as learned in the preceding grade. Change making. Measures of length and weight. Vocabulary study. Problem solving.	1
2	Two-place and three-place multipliers. Two-step problems. Averages. Liquid measure. Vocabulary study. Meaning of fractions. Fractional parts. A fraction in the quotient. Problem solving.	45
3	Long division with two-place divisors ending in 0 to 5. Measures of time and dry measure. Correcting quotient figures. Zero at the end of two-place quotients. Problem solving.	75
4	Meaning of fractions. Addition and subtraction of two fractions with like denominators. Equal fractions. Changing fractions. Addition and subtraction of two mixed numbers. Problem solving.	109
5	Numbers through millions. Roman numerals. The meaning of zero. Estimating answers. Long division with two-place divisors ending in 6 to 9. Three-place quotients. Magic squares. Correcting quotient figures. Zero in three-place quotients. Divisors from 13 to 19. 9 as a quotient figure. Problem solving.	135
6	Addition and subtraction of two fractions with unlike denominators. Vocabulary. Subtraction of fractions with carrying or borrowing. Adding three fractions. Changing fractions in quotients. Fractional parts of numbers. Easy multiplication of whole numbers by fractions and mixed numbers. Problem solving.	183
7	Meaning of decimals. Reading and writing decimals through hundredths. Addition and subtraction of decimals. Bar graphs. Magic squares. Vocabulary study. Problem solving.	225
8	Studying squares and rectangles. Finding perimeters and areas. Square measure. Studying triangles and circles. Scale drawing. Problem solving. Review of the year's work.	257
	Tables for reference and number facts with answers	305
	More practice	310
	Index	330

Before beginning the work in this book refer to "Suggestions to Teachers," pages 327-329, and Teacher's Guide and Key, pages 3-7. These sections contain discussion and explanation of number relationships, provision for individual differences and review, long division, and so on, with page references and valuable teaching suggestions.

Reteach and review basic skills in addition, subtraction, multiplication, and division. See Teacher's Guide and Key, page 8, for specific aims of Chapter 1.

Reteach understanding and reading of large numbers. Use this page also to spot-check for difficulties in place value, regrouping, and exchange (for later review).

Chapter 1

Thousands of Children

1. Jack read that last September 2974 children were in school in Greenfield where he lives. Of this number, 1585 were girls. How many boys were in school then? 1389*

2. Read the number 2974 and tell what it means. 2 thousand, 9 hundred 74; 2 thousands, 9 hundreds, 7 tens, 4 ones

3. The 2974 children were in high school and grade schools. There were 2296 children in all grade schools. How many were in the high school? 678 children

4. In the largest city in the state there were 223,168 school children. How many places has the number 223,168? 6 Try to read this number. 223 thousand, 1 hundred 68

5. The 5 cities next to the largest had these numbers of school children: 77,157; 19,398; 15,538; 14,635; 14,071. How many school children were there all together in these 5 cities last September? 140,799

6. There were 223,168 school children in the largest city. How many more were there in that city than in all the 5 cities in ex. 5? 82,369

7. Ask someone how many children there are in each school in your town or city. Make a problem from the numbers.

*For convenience here, only numerical part of answer is given. Pupils should give complete answer and process steps, as shown in Teacher's Guide and Key for each page. This procedure is used throughout the text.

Reteach place value of 6-figure numbers.

Studying Large Numbers

1. In the state where Betty lives there are 429,367 school children. The number 429,367 is a 6-place number and is read 429 thousand, 3 hundred 67. 429 means 4 hundreds, 2 tens, 9 ones. So 429 thousand means 4 hundred-thousands, 2 ten-thousands, 9 one-thousands. The sixth figure at the left is in hundred-thousands place. You can say that 429,367 means 4 hundred-thousands, 2 ten-thousands, 9 thousands, 3 hundreds, 6 tens, 7 ones.

2. A comma is put after the thousands in 429,367 to make it easier to read. In a 5-place number like 52,196 there is also a comma. In a 4-place number like 1958, the comma is often left out.

Read these numbers and tell what each means: See Guide page 9.

3.	4392	28,375	33,888	125,647	839,416
4.	2040	49,608	60,000	200,934	529,008

5. Write the numbers in ex. 3 and 4 as your teacher reads them. Remember that the comma comes when she says "thousand." How many figures must come after the comma? Three

6. The number 429,367 is made up of six parts. You can write the six parts as shown at the right. When you add the six parts you get the number again. Ask pupils how many tens (42,936), hundreds, and so on, there are in "entire" number.

400,000
20,000
9,000
300
60
7
429,367

7. Show how the number 169,247 is made of six parts as shown in ex. 6. See G-9.

8. In each number put a comma after the thousands; then read each number: 524316; 21385; 281347; 28000; 50950. See G-9.

9. What is the largest number you can write with 4 places? 9999 What is the smallest number you can write with 4 places? 1000

10. Bring to school newspaper clippings in which are some 4-place, 5-place, and 6-place numbers. See if all pupils can read them.

Use place-value chart or diagram (having words on it that go with each place), or vertical abacus, in reteaching. Let pupils write or show various numbers on these devices Have pupils regroup numbers also.

Reteach concept of zero as place holder.

Large Numbers

1. When Miss Black read some numbers for the children to write, she said, "Nine thousand five." Mary wrote 95, Bill wrote 905, and Ann wrote 9005. Which one is right? 9005

2. When you hear "nine thousand," how many places do you think the number has? 4 If you hear "twenty-five thousand," how many places does the number have? 5

3. When some places in a 4-place or 5-place number are not read, what figure do you put in those places? A zero How do you write **five thousand two?** 5002 **six thousand twenty?** 6020

4. Read these numbers and tell what each zero means: 6039; 1908; 7004; 28,073; 53,006; 30,070. See G-9.

5. What is the largest number you can write with 5 places? 99,999 with 6 places? 999,999 What is the smallest number you can write with 5 places? 10,000 with 6 places? 100,000

6. Last year ten cities in one state had these numbers of school children. Write the numbers in order, beginning with the largest number: 121,702; 83,406; 54,923; 51,428; 27,512; 25,508; 22,539; 17,483; 14,119; 12,252

17,483 12,252 83,406 51,428 54,923

22,539 25,508 27,512 121,702 14,119

Use devices mentioned on page 2. Give pupils opportunity to write numbers (with zeros) dictated by you. In ex. 4, ask pupils what the numbers would be without zeros. Let some pupils investigate and report on the story of zero.

Reteach rounding off numbers to nearest ten, hundred, thousand.

Round Numbers

1. Jack told his father there were 2974 school children in Greenfield last September. His father said, "That is about three thousand children." Why did he say that? Three thousand is an easier figure to remember and use.

2. Jack's father rounded off the number 2974 to the **nearest thousand** because it was so near 3000. People often use round numbers when they do not have to have the numbers exactly right. How would Jack's father round off the number 4125 to the nearest thousand? 4000

3. Betty's mother drove her car 209 mi. She said she had driven two hundred miles. She rounded off the number 209 to 200. Can you see why she did that? The figure was nearer 200 than 300.

4. The new school in Westfield cost $99,775. The newspaper stated, "$100,000 school to open soon." Is $100,000 a round number? Yes

5. Round off these numbers to the nearest hundred: 593; 600 816; 800 430; 400 781; 800 279; 300 469; 500 132. 100

6. Round off these numbers to the nearest thousand: 8120; 8000 6849; 7000 2053; 2000 5296; 5000 7773; 8000 9106. 9000

7. Jim saw a set of three spaceships in a store window. The price of the set was $4.98. He told his mother he wanted to buy a 5-dollar present with his birthday money. Why did Jim say that the price was $5.00 instead of $4.98? The price was closer to $5.00 than to $4.00.

8. Round off these numbers to the nearest dollar: $8.89; $9.00 $3.06; $3.00 $19.95; $20.00 $15.15; $15.00 $4.75; $5.00 $23.39; $23.00 $9.90; $10.00 $45.25. $45.00

9. Can you give a reason why a set of spaceships is marked $4.98 instead of $5.00? The price seems smaller.

If pupils ask, explain that a number that is halfway between two numbers (65) is usually rounded off to next higher ten (70), or, if working with hundreds, to next higher hundred.

Present diagnostic test of mastery of addition facts.

The 100 Addition Facts

This is a test on the addition facts. You should be able to give all the sums orally within the time stated by your teacher. Make a list of any facts that give you trouble and practice on them:

1.	7 5 12	5 2 7	6 9 15	4 8 12	9 0 9	3 5 8	8 5 13	2 2 4	9 5 14	2 9 11
2.	1 8 9	3 4 7	0 5 5	9 3 12	5 7 12	6 5 11	0 7 7	7 8 15	3 7 10	1 2 3
3.	1 1 2	5 9 14	8 8 16	5 4 9	0 0 0	4 1 5	2 8 10	6 0 6	2 1 3	0 4 4
4.	9 8 17	4 7 11	5 0 5	2 6 8	6 8 14	0 2 2	9 1 10	1 3 4	7 4 11	8 0 8
5.	5 3 8	6 4 10	7 9 16	8 4 12	2 4 6	5 8 13	4 0 4	6 6 12	0 1 1	9 4 13
6.	4 5 9	9 6 15	1 9 10	7 0 7	8 7 15	6 1 7	0 8 8	4 6 10	3 3 6	1 6 7
7.	8 3 11	5 1 6	6 7 13	3 0 3	4 3 7	9 9 18	3 8 11	2 0 2	3 1 4	8 9 17
8.	7 2 9	1 0 1	9 2 11	1 5 6	6 2 8	7 6 13	2 3 5	0 3 3	8 1 9	3 6 9
9.	4 4 8	3 2 5	5 6 11	4 9 13	7 1 8	2 5 7	0 9 9	7 3 10	2 7 9	5 5 10
10.	8 6 14	7 7 14	4 2 6	1 7 8	8 2 10	6 3 9	0 6 6	9 7 16	1 4 5	3 9 12

To the Teacher. See the suggestions on page 327 for giving this diagnostic test on the fundamental addition facts.

See G-10 for oral presentation of test. Note individual errors or hesitancy on pupils' progress cards. Group pupils for remedial work. Let others work at arithmetic corner on puzzles, projects, and so on (see G-108).

Review commutative principle for addition, number relationships, and self-helps in addition as preparation for adding by endings.

How to Help Yourself

1. Here are some ways to help yourself if you forget the answer to an addition fact.

2. The addition facts 7 + 2 and 2 + 7 make a pair of facts. The numbers in 7 + 2 are the same as those in 2 + 7 but they are reversed. **If two numbers are reversed, their sum is the same.** This is called the commutative principle for addition. Stress.

$$\begin{array}{r} 7\\ +2\\ \hline 9 \end{array} \qquad \begin{array}{r} 2\\ +7\\ \hline 9 \end{array}$$

3. Show how you can help yourself if you forget the answer to 3 + 8; 8+3 to 4 + 7; 7+4 to 5 + 8. 8+5

4. Facts in which 1 is added to another number are easy. You are really counting by 1's. How many are 7 + 1? 8 5 + 1? 6 1 + 9? 10 1 + 6? 7 8 + 1? 9

5. Facts in which 0 is added to another number are easy, too. **If you add a number and zero, the sum is the same as that number.** For this reason, 0 is called the identity element of addition. How many are 6 + 0? 6 9 + 0? 9 0 + 4? 4 0 + 0? 0 0 + 8? 8

6. Facts in which both numbers are the same are **doubles.** The addition facts below are the doubles. Look at the sums; they go by 2's:

$$\begin{array}{r} 1\\ 1\\ \hline 2 \end{array} \quad \begin{array}{r} 2\\ 2\\ \hline 4 \end{array} \quad \begin{array}{r} 3\\ 3\\ \hline 6 \end{array} \quad \begin{array}{r} 4\\ 4\\ \hline 8 \end{array} \quad \begin{array}{r} 5\\ 5\\ \hline 10 \end{array} \quad \begin{array}{r} 6\\ 6\\ \hline 12 \end{array} \quad \begin{array}{r} 7\\ 7\\ \hline 14 \end{array} \quad \begin{array}{r} 8\\ 8\\ \hline 16 \end{array} \quad \begin{array}{r} 9\\ 9\\ \hline 18 \end{array}$$

7. The doubles help you to learn the **near doubles.** If you know that 5 + 5 = 10, you can tell that 5 + 6 is 1 more than 10, or 11. You know that 7 + 7 = .14. Then how many are 7 + 8? 15 How many are 8 + 7? 15

8. What near-double facts can you make if you know that 6 + 6 = 12? if you know that 4 + 4 = 8? Give two more doubles and the near-double facts you can make from them.

9. There is an easy way to add 9 to a number. For example, to add 9 and 4, take 1 from 4 and add it to 9. You now

Reinforce understanding of relationships by demonstration, using objects or drawings. Have pupils use other facts to illustrate different helps.

The associative (or grouping) principle for addition is applied in ex. 9, 11.

have 10 + 3, or 13. So 9 + 4 is the same as 10 + 3, or 13. Show how to get the sum of 9 + 6 this way. Take 1 from 6 and add it to 9. You now have 10 + 5, or 15.

10. How many are 9 + 5? 14 9 + 3? 12 9 + 7? 16 9 + 2? 11

11. You can add 8 to a number the same way you add 9. For example, to add 8 and 6, take 2 from 6 and add it to 8. You now have 10 + 4, or 14. So 8 + 6 is the same as 10 + 4, or 14. Show how to get the sum of 8 + 5 this way. Take 2 from 5 and add it to 8. You now have 10 + 3, or 13.

12. How many are 8 + 3? 11 8 + 9? 17 6 + 8? 14 8 + 4? 12 7 + 8? 15

13. Ex. 1–12 on pages 6 and 7 show how you can help yourself to get the answers to all but four of the 100 addition facts. These four facts are 7 + 4 = 11, 4 + 7 = 11, 7 + 5 = 12, and 5 + 7 = 12. To find the sum of 7 and 4, think, "7 + 3 = 10, so 7 + 4 = 11." If 7 + 4 = 11, how many are 4 + 7? 11

14. You know that 7 + 4 = 11, so 7 + 5 = 12. This tells you that 5 + 7 = 12.

15. If you do not know the answer to an addition fact, try to get help from a fact you do know.

16. The addition facts help you to add by endings. You know that 4 + 5 = 9. So 14 + 5 = 19, 24 + 5 = 29, 34 + 5 = 39, 44 + 5 = 49, and so on. Use other basic facts to emphasize that end figure is known from basic fact.

Give the answers:

17.

13	24	42	60	25	37	81	76
6	3	5	9	3	1	4	2
19	27	47	69	28	38	85	78

18. When an addition fact has a sum of 10 or more, like 8 + 6 = 14, then 18 + 6 = 24 and 48 + 6 = 54 because there is 1 more ten in the sum than there is in the 2-place number. Demonstrate with other facts, stressing knowledge of end figures and "automatic" increase by 1 ten of tens figure in sum.

Give the answers:

19.

25	18	39	86	47	23	54	62
6	7	2	6	4	8	9	8
31	25	41	92	51	31	63	70

This skill must be done in one mental operation, with no carrying. Give further practice, using adding-by-endings cards, or oral counting exercises (see G-11).

Reteach column addition involving adding by endings. Begin class vocabulary chart, showing new words, meanings, illustrated examples.

How Well Can You Add?

1. **Problem** Find the sum of 46, 57, and 24. 127

Explanation Start at the bottom and add up. Begin with the ones and think "4, 11, 17." Write 7 in ones place and carry 1 ten to tens column. Think "3, 8, 12." Write 2 in tens place and carry 10 tens, or 1 hundred, to hundreds place. The answer is 127. Check by adding down. Stress adding "carried" number immediately.

Emphasize.

$$\begin{array}{r} 46 \\ 57 \\ \underline{24} \\ 127 \end{array}$$

In addition the answer is called the **sum.** The numbers you add are called the **addends.** Learn these words. Put on chart.

Show exchange of ones and tens on place pocket chart.

Copy in columns, add, and check: Stress reversing direction in checking.

2. 67 + 75 + 83 + 44 269

3. 74 + 68 + 91 + 48 281

4. 49 + 39 + 47 + 65 200

5. 75 + 44 + 76 + 68 263

6. 95 + 83 + 76 + 86 340

7. 47 + 96 + 98 + 23 264

8. 84 + 59 + 65 + 54 262

9. 67 + 88 + 30 + 66 251

Column addition and check illustrate associative principle for addition.

Begin at the bottom and add up. Check by adding down: Stress.

10.	134	354	934	225	626	187	1892
	550	537	387	966	647	671	5667
	512	401	340	225	383	429	3182
	586	315	339	643	504	545	5134
	1782	1607	2000	2059	2160	1832	15,875
11.	674	390	698	534	251	534	2297
	125	838	171	103	728	446	1953
	658	975	499	981	382	250	2312
	458	219	707	558	229	827	3607
	1915	2422	2075	2176	1590	2057	10,169

Give the answers: Have pupils give basic facts also.

12.	32 + 7 39	65 + 3 68	24 + 7 31	47 + 3 50	30 + 6 36
13.	46 + 5 51	73 + 8 81	50 + 9 59	19 + 7 26	41 + 9 50
14.	81 + 6 87	59 + 3 62	67 + 7 74	93 + 6 99	88 + 8 96
15.	78 + 4 82	94 + 8 102	12 + 9 21	75 + 8 83	26 + 7 33

More Practice. See ① on page 310. See page 329 for explanation.

Have pupils do some examples orally to check difficulties with basic facts, adding by endings, or carrying. Do not permit pupils to say, "4 and 7 are 11," and so on.

Reteach meaning of addition. Review some addition thought patterns.

Addition Problems

Demonstrate and emphasize.

You use addition when you put together two or more groups of the same things.

Work the addition problems below. Read the problems carefully and you will see that the words of each problem tell you to put together two or more groups of the same things. Sometimes special words help you to know that you must add:

1. Mother baked 48 chocolate cookies and 50 orange cookies. How many cookies in all did Mother bake? 98

2. Bill had 75 stamps. He bought 25 stamps today. How many stamps has Bill all together? 100

3. Jane sold 18 tickets and Mary sold 15 tickets. How many tickets did both girls sell? 33

4. Yesterday Don earned \$.50. Today he earned \$.75. How much did Don earn in two days? \$1.25

5. Ann had 5 strings of beads. For her birthday she got 2 more. How many strings of beads has Ann now? 7

6. Jack spent 10¢ for a red pencil and 5¢ for a black pencil. How much did Jack spend for pencils? 15¢

7. When the Camp Fire Girls sold candy Jean sold 17 boxes, Helen sold 24 boxes, and Susan sold 14 boxes. How many boxes of candy did they sell in all? 55

8. Make up an addition problem about money that uses the words **in all** or **all together.**

9. Make up an addition problem using the word **both.**

Have pupils pick out key words or phrases in ex. 1-6 that tell them to add. Let different pupils read their problems for ex. 7-9 for class to solve.

Making Change

Bill works in the school store. He can make change quickly when he sells things. Bill uses as few coins as possible. For example, if Ann gives him a quarter to pay for a 12-cent ruler, he gives Ann 3 pennies and 1 dime in change. He does not give her 3 pennies and 2 nickels unless he is out of dimes.

1. Bill sold Jack a notebook for 17¢. Jack gave him a quarter. When Bill gave Jack the change he said, "17." Then he handed Jack 3¢ and said, "18, 19, 20"; then he gave Jack a nickel and said, "25." Sometimes Bill says, "17, 20, 25."
2. Don gave Bill a half dollar to pay for a 20-cent tube of paste. Tell how Bill made the change and what he said as he gave it to Don. See G-13. How many coins did Bill give Don? 2
3. Tell another way Bill could have made the change for Don by giving him more coins than he did in ex. 2. Using 3 dimes
4. Susan spent \$.19 and \$.33 at the school store. She gave Bill \$1.00. Count the change as Bill did when he gave it to Susan. \$.19 + \$.33 = \$.52; 52, 55, 65, 75, one dollar
5. Joe spent \$.30. He gave Bill \$1.00. Bill gave Joe 2 nickels, 1 dime, and 2 quarters. Was that the right change? Yes Count the change as Bill did. 30, 35, 40, 50, 75, one dollar

Use actual coins or toy money to review change making (beginning with amounts under 25¢) and give pupils many oral exercises. Stress beginning with cost of article in making or checking change.

6. Miss Hunt spent 24¢ at the school store. She gave Bill a half dollar. Show how Bill could have made the change with 2 coins; (1)with 4 coins; (2)with 5 coins; (3)with 6 coins. (4) Which is the best way and why? (1) 1 cent, 1 quarter; (2) 1 cent, 1 nickel, 2 dimes; (3) 1 cent, 3 nickels, 1 dime; (4) 1 cent, 5 nickels

7. Mr. Wood spent 18¢. He gave Bill a quarter and 3 cents. Bill gave him a dime in change. Was the change right? Yes Can you tell why Mr. Wood gave Bill a quarter and 3 cents instead of giving him only a quarter? To avoid having more pennies

8. Suppose you have 1 quarter and 6 pennies. You buy pencils for 12¢. What coins can you give Bill so that you will have fewer pennies than the 6 you had at first? What change will Bill give you? 1 nickel and 1 dime 1 quarter, 2 cents

9. Sally spent 46¢ and gave Bill a half dollar. Bill had no pennies, so he asked Sally if she could give him a penny. She gave him 1¢. What coin did Bill give Sally in change? 1 nickel

10. At the bank Bill got $5.00 changed into coins. He asked for one dollar's worth of nickels, two dollars' worth of dimes, and two dollars' worth of quarters. How many coins of each kind did Bill get? 20 nickels, 20 dimes, 8 quarters

11. Start with 11¢ and add these coins to it: 4 pennies, 1 dime, 3 quarters. What is the sum? $1.00

12. Suppose you have three of each of the coins less than one dollar. How much money have you? $2.73

Stress fact that least number of coins are used in making change.

Present diagnostic test of mastery of subtraction facts.

The 100 Subtraction Facts

This is a test on the subtraction facts. You should be able to give all the answers orally within the time stated by your teacher. Make a list of any facts that give you trouble and practice on them:

1.	8	7	6	9	3	7	16	13	11	14
	4	2	0	8	1	7	9	7	2	8
	4	5	6	1	2	0	7	6	9	6
2.	4	5	8	4	7	8	11	12	10	13
	0	4	1	2	3	8	7	8	6	9
	4	1	7	2	4	0	4	4	4	4
3.	2	9	6	2	5	9	15	10	17	10
	2	3	2	0	1	6	7	8	9	2
	0	6	4	2	4	3	8	2	8	8
4.	6	4	1	9	6	0	14	12	10	16
	1	4	0	1	4	0	5	7	5	8
	5	0	1	8	2	0	9	5	5	8
5.	9	7	3	5	7	8	13	15	11	12
	2	4	2	5	1	3	4	8	6	9
	7	3	1	0	6	5	9	7	5	3
6.	5	6	8	4	9	17	14	12	10	11
	2	5	6	3	4	8	9	4	7	8
	3	1	2	1	5	9	5	8	3	3
7.	2	9	5	8	7	12	14	10	13	15
	1	9	0	2	5	6	7	4	8	6
	1	0	5	6	2	6	7	6	5	9
8.	8	3	6	9	5	13	11	10	16	12
	7	0	3	0	3	5	4	9	7	3
	1	3	3	9	2	8	7	1	9	9
9.	6	4	9	1	7	11	10	18	11	10
	6	1	5	1	0	9	3	9	5	1
	0	3	4	0	7	2	7	9	6	9
10.	8	3	7	8	9	15	13	11	14	12
	0	3	6	5	7	9	6	3	6	5
	8	0	1	3	2	6	7	8	8	7

To the Teacher. See the suggestions on page 327 for giving this diagnostic test on the fundamental subtraction facts.

Note errors or hesitancy on progress cards. Have pupils make small flash cards to use for further study on facts. See page 5 and G-10 for other suggestions and oral presentation of test.

Reteach relationship between addition and subtraction. Help in remembering facts is based on idea that subtraction is the inverse operation of addition, i.e., it "undoes" addition.

How to Help Yourself

1. You may have had trouble with the subtraction facts on page 12. Here are some ways to help yourself if you forget the answer to a subtraction fact.

2. Suppose you do not know 8 − 5. Draw 8 dots on your paper. Cover up 5 dots. How many dots are left?3 How many are 5 from 8?3 How many are 8 − 5?3 You can always draw dots to help you find the answer.

3. Here is another way to help yourself. Suppose you do not remember what 6 from 14 equals. Think, "6 and 8 are 14." Then you know that 6 from 14 is 8. The addition fact 6 + 8 = 14 shows you that 14 − 6 = 8 and 14 − 8 = 6. The addition facts help you with the subtraction facts.

Tell the numbers that go in the spaces:

4. 9 and 6. . are 15, so 9 from 15 is 6. .   15 − 9 = 6. .
5. 7 and 4. . are 11, so 7 from 11 is 4. .   11 − 7 = 4. .
6. 5 and 8. . are 13, so 5 from 13 is 8. .   13 − 5 = 8. .
7. 8 and 9. . are 17, so 8 from 17 is 9. .   17 − 8 = 9. .
8. 7 and 7. . are 14, so 7 from 14 is 7. .   14 − 7 = 7. .
9. 9 and 7. . are 16, so 9 from 16 is 7. .   16 − 9 = 7. .
10. 5 and 7. . are 12, so 5 from 12 is 7. .   12 − 5 = 7. .

Give the answers: Have pupils give related addition fact.

11. 9 − 4 5   8 − 5 3   18 − 9 9   11 − 3 8   16 − 8 8
12. 6 − 3 3   7 − 3 4   15 − 7 8   14 − 9 5   13 − 4 9
13. 8 − 2 6   9 − 7 2   12 − 8 4   17 − 9 8   15 − 6 9
14. 7 − 5 2   4 − 0 4   10 − 5 5   12 − 7 5   14 − 5 9
15. 4 − 4 0   6 − 4 2   13 − 6 7   16 − 7 9   10 − 8 2

To the Teacher. Caution pupils never to write in their books to fill in blank spaces.

Follow development as given on this page. Let some pupils demonstrate ex. 4-10 with dot or line drawings on blackboard, showing that same groups are used, but positions are changed.

Reteach subtraction of 3-figure and 4-figure numbers involving regrouping. Introduce subtraction terms.

How Well Can You Subtract?

1. **Problem** Jim drove to New York with his father. They drove 1375 mi. to go there and 2050 mi. to return another way. How much farther did they drive on the return trip? 675 mi.

Explanation Subtract the ones. Think, "10 − 5 = 5." Write 5 in ones place. Think, "14 − 7 = 7." Write 7 in tens place. Think, "9 − 3 = 6." Write 6 in hundreds place. Think, "1 − 1 = 0." Do not write 0 because there are no more figures to subtract. Stress Check by adding 675 and 1375 to see if they make 2050.

$$\begin{array}{r} 2050 \\ \underline{1375} \\ 675 \end{array}$$

In this problem 2050 is the **minuend,** 1375 is the **subtrahend,** and 675 is the **remainder** or **difference.** Learn these words. Add words to vocabulary chart (page 8).

Copy the numbers in columns, subtract, and check:

2. From 489 subtract 324. 165 — Subtract 3578 from 6341. 2763

3. From 594 subtract 578. 16 — Subtract 6645 from 9538. 2893

4. From 400 subtract 147. 253 — Subtract 1479 from 6224. 4745

5. From 823 subtract 568. 255 — Subtract 5787 from 7775. 1988

6. From 722 subtract 338. 384 — Subtract 2963 from 4362. 1399

Note that check is based on fact that subtraction is the inverse operation of addition.

Subtract. Check your work by adding: Stress.

7.	841 565 276	839 398 441	735 669 66	433 254 179	808 198 610	6398 2354 4044	4806 4299 507
8.	887 698 189	311 222 89	688 179 509	300 158 142	375 278 97	7382 4547 2835	6000 4764 1236
9.	520 196 324	913 118 795	753 487 266	764 599 165	900 377 523	6562 2584 3978	5000 2123 2877

More Practice. See ② on page 310. Use for individual help.

To the Teacher. See page 329 for the additive method of subtraction.
First review subtraction without regrouping, then 1-step and 2-step regrouping. Use place pocket chart to demonstrate; stress that 1 ten or 1 hundred is regrouped (not just 1). Have pupils explain their work.

Review eight subtraction thought patterns.

Helps in Subtraction Problems

Demonstrate and emphasize.

You use subtraction when you take away a group of things from a larger group of the same things. If you take away all of the group, the answer is zero.

Some pupils might like to work on chart, showing patterns, illustrated sample problems, and solutions.

1. You subtract to find

(a) how many are left.

(b) how many more are needed.

(c) how many are gone.

(d) how much change you should get.

(e) the other part of a number.

(f) the difference between two numbers.

(g) how much more or less one number is than another.

(h) how much longer or shorter one thing is than another.

Read each problem carefully. Tell which letter in ex. 1 fits the problem. Then work the problem:

2. Mary had 50¢ to spend at the park. She had 12¢ left when she came home. How much money did Mary spend? (c), 38¢

3. Don sold 75 tickets and Bob sold 83. What is the difference in the numbers of tickets the boys sold? (f), 8

4. At the store Susan spent $3.38. She gave the man a 5-dollar bill. How much change did she get? (d), $1.62

5. Betty has saved $7.89. Her brother has saved $9.25. How much less has Betty saved than her brother? (g), $1.36

6. Mr. Chase had 500 chickens. He sold 325 of them in the summer. How many chickens has Mr. Chase now? (a), 175

7. Bill has a quarter. He wants to buy a 39-cent book. How much more money does Bill need? (b), 14¢

Have pupils make up own problems illustrating the different thought patterns. Begin arithmetic scrapbook in which to keep this work and other projects. Let class solve some of the problems, giving pattern first.

Present written review of addition and subtraction.

Problems and Practice

1. Mrs. Glass spent \$3.45 for meat, \$4.08 for groceries, \$.95 for fruit, and \$1.17 for vegetables. How much did she spend all together? \$9.65

2. Bill made change for Mrs. Glass when she paid for the things in ex. 1. She gave him a 10-dollar bill. How much change did Bill give her? \$.35 Write the number of each kind of coin Bill gave Mrs. Glass. 1 dime and 1 quarter

3. Last week Mrs. Glass spent \$7.98 for food. How much more or less was that than she spent in ex. 1? \$1.67 less

Add these numbers and check: Stress checking.

4.	53	23	597	467	359	5817	2274
	36	78	457	363	699	8684	5785
	74	56	634	809	548	2482	7319
	78	43	584	435	224	3017	2753
	241	200	2272	2074	1830	20,000	18,131
5.	65	59	611	310	564	7324	1767
	96	12	456	534	270	2442	1045
	13	98	300	244	251	5133	2638
	21	56	528	539	335	5366	1723
	195	225	1895	1627	1420	20,265	7173

6. Find the sum of \$52.96, \$34.91, \$78.86, and \$33.27. \$200.00

7. How much added to \$18.36 will make \$25.00? \$6.64

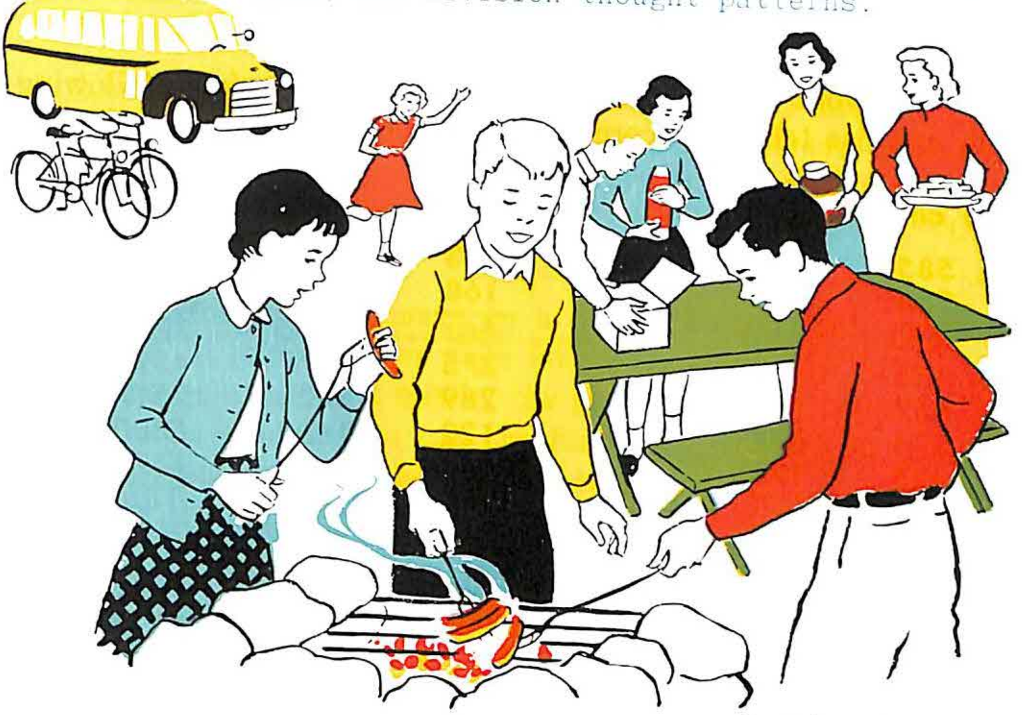
8. Find the difference between \$39.95 and \$45.50. \$5.55

Subtract and check your work: Stress checking.

9.	86	91	126	628	532	6547	3000
	47	23	33	386	465	6368	1453
	39	68	93	242	67	179	1547
10.	70	43	383	600	658	5272	5645
	52	17	254	479	179	2787	1786
	18	26	129	121	479	2485	3859
11.	64	85	142	300	407	5000	9006
	38	79	78	292	158	3861	7124
	26	6	64	8	249	1139	1882

Use folded-paper method (see page 328) for ex. 4, 5, 9, 10, 11. Help pupils who made mistakes to analyze their errors. Let others work on scrapbooks or at arithmetic corner.

Present problems involving addition, subtraction, multiplication, and division thought patterns.



A School Picnic

1. The Hill School had a picnic last Saturday. All but 9 of the 255 children were there. How many children went to the picnic? 246

2. There were also 6 mothers and 8 teachers at the picnic. How many people were there in all? 260 See ex. 1.

3. The school busses carried 208 people and 40 people rode in cars. The rest rode their bicycles. How many rode to the picnic on bicycles? 12

4. The busses left the school at 9:30 A.M. and returned there at 6:45 P.M. How many hours and minutes were they gone? Look at a clock if you need help. 9 hr. 15 min.

5. The children cooked hot dogs over a big fire. There were 540 hot dogs in all. Could each one at the picnic have 2 hot dogs? See ex. 2. Yes; 260 + 260 = 520 hot dogs

6. There were enough rolls for each hot dog and 2 doz. extra. How many rolls were there? 564 How many are 1 doz. rolls? 12

Have pupils estimate answers first; remind them that we do not use exact numbers as in problem, but ones that mean about the same (rounded off). Stress labeling of answers. Let superior pupils do ex. 4.

Provide diagnostic test in addition and subtraction.

Testing Yourself

Do your work carefully. The number in the circle following each exercise tells the score for that exercise.

Add and check:

1.	585	342	649	393	2640	4458	
	284	126	365	168	1165	2779	⑫
	869	468	1014	561	3805	7237	
2.	436	387	319	375	2379	4591	
	657	425	260	289	2821	2517	
	374	676	528	122	1643	5800	
	425	171	254	214	4454	1576	㉔
	1892	1659	1361	1000	11,297	14,484	

Subtract and check:

3.	795	532	842	4002	5515	7000	
	229	373	698	3745	4598	2136	⑱
	566	159	144	257	917	4864	

4. Find the sum of $47.95 and $14.59. $ 62.54 ⑤

5. From 344 subtract 258; 86 take 586 from 721. 135 ⑥

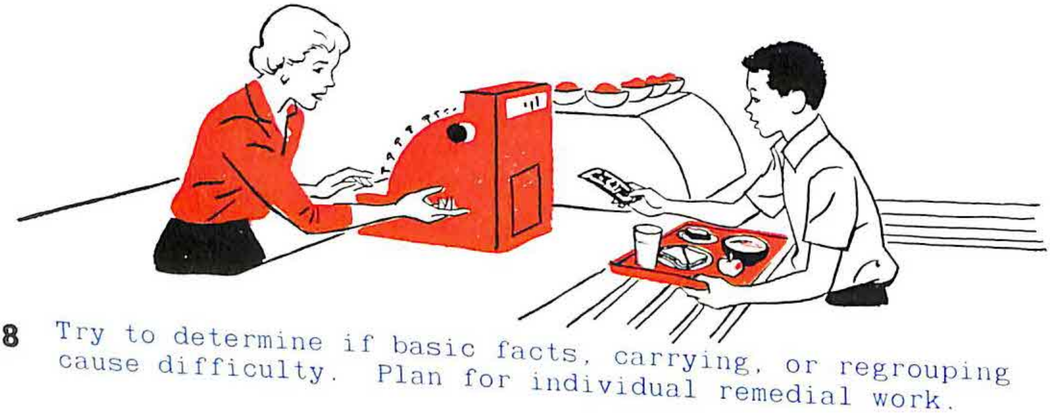
6. Find the difference between 896 and 1585. 689 ⑤

7. How much are $3.97 + $4.86 + $7.00 + $5.17? $ 21.00 ⑤

8. How much less is 2093 than 5001? 2908 ⑤

9. For lunch at school Jack spent $.15 for soup, $.15 for a sandwich, $.07 for milk, $.03 for a cookie, and $.05 for an apple. How much did Jack's lunch cost? $.45 ⑩

10. Jack paid for his lunch with a 1-dollar bill. How much change did he get? $ .55 ⑩



Try to determine if basic facts, carrying, or regrouping cause difficulty. Plan for individual remedial work.

Present diagnostic test of mastery of multiplication facts.
Reteach commutative principle for multiplication.

The 100 Multiplication Facts

1. The 100 multiplication facts look like the 100 addition facts on page 5 except that you multiply the numbers instead of adding them. Turn to page 5 and try to give all the products for that page within the time stated by your teacher. Give the answers only. See G-15.

2. Stress. If you forget the answer to a multiplication fact, you can find it in the table on page 308. A better way to get the answer is to figure it out by the plans shown on pages 19–23. Learn as soon as you can the facts which give you trouble. Then you will not need to use these helps.

3. The multiplication facts go together in pairs. For example, 8 × 4 and 4 × 8 make a pair of facts. The numbers in 8 × 4 are the same as those in 4 × 8 but they are reversed. Both products are 32. Stress. **If two numbers are reversed, their product is the same.** This is called the commutative principle for multiplication. If you forget the answer to 4 × 8, reverse the numbers and try 8 × 4. If you remember that 8 × 4 = 32, this tells you that 4 × 8 = 32.

$\begin{array}{r} 8\\ 4\\ \hline 32 \end{array}$ $\begin{array}{r} 4\\ 8\\ \hline 32 \end{array}$

4. Suppose you forget the answers to the following facts. Reverse the numbers and then try to multiply them:

9 × 6 54 7 × 9 63 5 × 8 40 4 × 6 24 3 × 8 24 5 × 9 45

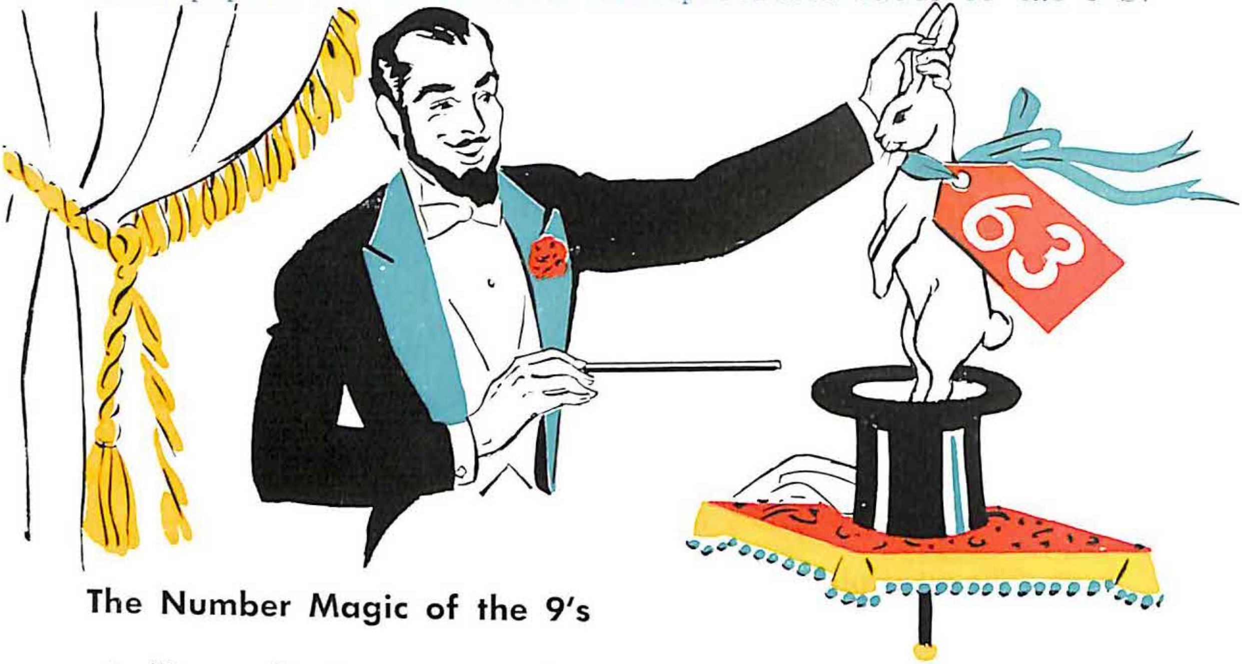
5. Whenever a multiplication fact contains a 0, like 9 × 0 or 0 × 4, the answer is always 0. Why?
No matter how many times you add zero, your sum is zero.

6. When you forget a multiplication fact, you can also get help from a known fact which is near it. Suppose you forget 6 × 7, but you know 5 × 7. You can find 6 × 7 by adding 5 × 7 and 7. So 6 × 7 = 35 + 7 = 42. This is true because 5 sevens and 1 seven equal 6 sevens.

7. Tell how you can find 7 × 8 if you know 6 × 8, by using the plan given in ex. 6. Tell how you can find 5 × 8 if you know 4 × 8, using the same plan. 6×8+8=56. 4×8+8=40

Give test orally (see page 327). Plan for remedial work, using suggestions in ex. 2-3, and on pages 20-23. See G-111, 112 for suggested games and aids for use in reinforcing facts.

Teach pupils how to remember multiplication facts of the 9's.



The Number Magic of the 9's

1. You will learn some interesting tricks in number magic by studying the 9's facts in multiplication. The answers to these facts are shown in column A. The first answer is 18; if you add 1 and 8, the sum is 9. The next answer is 27; if you add 2 and 7, the sum is 9. The next answer is 36; you see that 3 + 6 = 9. Add the figures in each of the other answers. Is the sum always 9? Yes

A

2 × 9 = 18

3 × 9 = 27

4 × 9 = 36

5 × 9 = 45

6 × 9 = 54

7 × 9 = 63

8 × 9 = 72

9 × 9 = 81

2. In the table you find that the answer for 8 × 9 is 72. If you cover up the 2 of 72 so that you see only the 7, you know that the figure covered up must be 2 because 7 and 2 make 9. Without looking at the table, tell the second figure of the answer if the first figure is 5. Think, "5 and what make 9?" 4

3. What is the second figure of the answer if the first figure is 8? 1 if the first figure is 4? 5 if the first figure is 3? 6 if the first figure is 6? 3

If you know only the first figure of an answer in the 9's table, you can get the second figure by adding enough to the first figure to make 9.

See G-16 for explanation of number relationships involving 9's facts. Note that purpose of this work is to show pupils how to obtain forgotten answer by process of thinking.

4. Here is some more of the magic in the table of 9's. Start with $3 \times 9 = 27$. In this fact 9 is multiplied by 3. Notice that the first figure of the answer is 2, which is 1 less than 3.

5. Study $4 \times 9 = 36$. Here 9 is multiplied by 4. The first figure of the answer is 3, which is 1 less than 4.

6. Study all the other facts in the table in ex. 1. Is the first figure of the answer always 1 less than the number by which 9 is multiplied? Yes What is the first figure of the answer for 8×9? 7 for 4×9? 3 for 5×9? 4 for 9×9? 8 for 7×9? 6

In the 9's table, the first figure of each answer is 1 less than the number by which 9 is multiplied.

7. You are now ready to do a magic trick. Suppose you forget the answer to 7×9. The first figure of the answer must be 1 less than 7, which is 6. To get the second figure of the answer, add enough to 6 to make 9. Since 6 and 3 make 9, the answer is 63. So $7 \times 9 = 63$.

8. Suppose you forget the answer to 8×9. Think, "1 less than 8 is 7. 7 and 2 are 9, so the answer is 72. $8 \times 9 = 72$."

9. Use the magic trick to find the answer to 6×9; 54 to 5×9; 45 to 3×9; 27 to 7×9; 63 to 4×9. 36

10. The magic trick will also give you the answers to facts like these: 9×7, 63 9×5, 45 9×3, 27 9×6, 54 9×8, 72 9×4. 36 Find the answers.

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Teach pupils how to remember multiplication facts for the 4's, 6's, and 8's (pages 22-23).

If You Forget the 4's Facts

1. You know that 4 is twice as much as 2, so 4 fives (4 × 5) is twice as much as 2 fives (2 × 5). This is true because 4 × 5 = 20, while 2 × 5 = 10. 20 is twice as much as 10.

2. You also see that 4 × 6, which equals 24, is twice as much as 2 × 6, which equals 12. **When you multiply by 4 the answer is twice as large as when you multiply by 2.**

3. If you forget the answer to 4 × 7, take $\frac{1}{2}$ of 4, which is 2. Then find the answer for 2 × 7 and double it. Think, "2 × 7 = 14, 2 × 14 = 28. So 4 × 7 = 28." When you double a number, you multiply it by 2.

4. If you forget 4 × 6, try 2 × 6 and double the answer. Think, "2 × 6 = 12, 2 × 12 = 24. So 4 × 6 = 24."

5. You can use this same plan when 4 is the second number. If you forget 7 × 4, take $\frac{1}{2}$ of 4, which is 2. Then find 7 × 2 and double the answer. Think, "7 × 2 = 14, 2 × 14 = 28. So 7 × 4 = 28."

6. Double these numbers. Do the work mentally:

14 28 12 24 16 32 10 20 18 36 15 30 21 42 24 48

Suppose you forget these facts. Find the answers as shown above. Do all the work mentally: Stress.

7. 4 × 5 20 4 × 7 28 4 × 4 16 6 × 4 24 9 × 4 36

8. 4 × 8 32 4 × 9 36 4 × 6 24 7 × 4 28 8 × 4 32

Demonstrate and emphasize.

If you cannot multiply by 4, multiply by $\frac{1}{2}$ of 4, which is 2. Then double the answer.

To the Teacher. The helps given on pages 22 and 23 assume that the pupil has mastered the multiplication facts for the 2's, 3's, and 5's. If a pupil forgets a fact involving the 4's, 6's, 7's, or 8's, it can be found mentally as shown on pages 22 and 23. The only fact not covered is 7 × 7. The 9's facts are provided for on pages 20 and 21.

As on pages 20-21, purpose of work is to help pupils find answers to facts forgotten, by means of process of thinking. Follow development as given. If necessary, let some pupils prove relationships using objects.

If You Forget the 6's or 8's

1. You know that 6 is twice as much as 3, so 6 × 5 is twice as much as 3 × 5. This is true because 6 × 5 = 30 and 3 × 5 = 15. 30 is twice as much as 15.

2. If you forget the answer to 6 × 7, take $\frac{1}{2}$ of 6, which is 3. Then find the answer to 3 × 7 and double it. Think, "3 × 7 = 21, 2 × 21 = 42. So 6 × 7 = 42."

3. If you forget the answer to 9 × 6, take $\frac{1}{2}$ of 6, which is 3. Then find the answer to 9 × 3 and double it. Think, "9 × 3 = 27, 2 × 27 = 54. So 9 × 6 = 54."

4. Double these numbers. Do the work mentally:
24 48 27 54 28 56 32 64 36 72 21 42 20 40 18 36

Suppose you forget these facts. Find the answers as shown above:

5. 6 × 4 24 6 × 8 48 9 × 6 54 7 × 6 42 5 × 6 30

6. 6 × 9 54 6 × 5 30 6 × 7 42 6 × 6 36 8 × 6 48

7. The plan above can be used to multiply by 8. If you forget 8 × 7, take $\frac{1}{2}$ of 8, which is 4. Then find 4 × 7 and double the answer. Think, "4 × 7 = 28, 2 × 28 = 56. So 8 × 7 = 56." To find 8 × 6, take $\frac{1}{2}$ of 8, which is 4. Then try 4 × 6 and double it. Or take $\frac{1}{2}$ of 6, which is 3. Then find 8 × 3 and double it. Both give the same answer.

Show how to get the answers by the plan used above:

8. 8 × 5 40 8 × 8 64 8 × 7 56 8 × 6 48 9 × 8 72

9. 8 × 9 72 7 × 8 56 4 × 8 32 5 × 8 40 6 × 8 48

Demonstrate and emphasize.

If you cannot multiply by 6, multiply by $\frac{1}{2}$ of 6, which is 3. Then double the answer.

If you cannot multiply by 8, multiply by $\frac{1}{2}$ of 8, which is 4. Then double the answer.

Note that examples on pages 22-23 are all mental work. Do not permit pupils to use pencil or paper in finding answers.

Reteach meaning of multiplication (short way of making equal additions).

Helps in Multiplication Problems

Multiplication is a short way to add when the numbers are all the same. To find how many there are in all, add when the numbers are not the same; multiply when they are the same.
Use ex. 1, 3-5 to illustrate.

If you know the number in one group, multiply to find the number in two or more groups of the same size.

If you know the cost of one thing, multiply to find the cost of two or more of these things.

Read each problem carefully. Then work it:

1. Mr. Cross bought 2 boxes of oranges. In each box there were 216 oranges. How many oranges did he buy? 432
2. Mother baked 3 pans of cookies. One pan held 30 cookies, another held 36 cookies, and the third held 32 cookies. How many cookies did Mother bake? 98
3. Bill can make 96 tickets from 1 sheet of cardboard. How many tickets will 4 sheets of the same size make? 384
4. Jack bought 3 neckties at $.75 apiece. How much did he spend for the neckties? $2.25
5. Find the cost of 6 tickets at 25¢ each. 150¢, or $1.50
   ▶ When an answer is larger than 100¢, change the answer to dollars and cents. Stress.
6. Make a multiplication problem about finding the cost of several bags of peanuts.
7. Make an addition problem about finding the cost of three different things.
8. Make a multiplication problem about finding the number of pencils in several boxes of pencils.
9. Make an addition problem about finding the number of tickets Ann sold in three days.

Do ex. 1-5 orally with pupils, having them explain why they cannot multiply in ex. 2, but can in ex. 1, 3-5. Let different pupils read their problems for ex. 6-9, to check understanding.

How Well Can You Multiply?

1. Problem Yesterday Jack and his father drove 167 mi. to High Point. They came home by the same road. How far did Jack and his father drive? 334 mi.

Explanation You need to multiply 167 by 2.

167
2
334

Begin with the ones. Think, "2 × 7 = 14." Write 4 in ones place and carry 1 ten to tens place. Think, "2 × 6 = 12. 12 + 1 (carried) = 13." Write 3 in tens place and carry 1 hundred to hundreds place. Think, "2 × 1 = 2. 2 + 1 (carried) = 3." Write 3 in hundreds place. Jack and his father drove 334 mi. Check the work by going over it.

In this example 167 is the **multiplicand;** 2 is the **multiplier;** 334 is the **product.** 167 and 2 are also called **factors** of 334. Learn these words. Add to class chart.

2. Study these multiplication examples carefully:

39	547	608	1270	$26.94
4	6	5	8	7
156	3282	3040	10160	$188.58

In ex. 3–7 urge pupils to estimate answers first (see G–17).

Multiply. Check by going over your work: Have pupils explain work.

3.	78	35	80	234	600	1930	$40.19
	5	8	9	2	9	4	6
	390	280	720	468	5400	7720	$241.14
4.	60	46	53	209	983	1758	$25.37
	3	7	6	5	8	2	9
	180	322	318	1045	7864	3516	$228.33
5.	96	72	49	617	385	3214	$20.75
	2	6	5	8	7	3	4
	192	432	245	4936	2695	9642	$83.00
6.	29	48	37	148	164	2480	$35.86
	7	4	3	9	5	8	6
	203	192	111	1332	820	19,840	$215.16
7.	94	70	29	693	645	2807	$65.98
	9	6	8	4	8	3	7
	846	420	232	2772	5160	8421	$461.86

Use pocket chart to show exchange in ex. 1. Stress order of multiplication and reason why "carried number" is added "after" each multiplication.

Show how to make and enjoy magic squares.

Magic Squares

1. The square at the right is a magic square. Each column and each row have the same sum. The numbers along each dotted line also have this sum. For example, 10 + 13 + 4 + 15 = 42, 12 + 7 + 18 + 5 = 42, 15 + 5 + 8 + 14 = 42, 10 + 7 + 11 + 14 = 42. There are 10 sums in all that equal 42, each sum coming from adding four numbers. Find the numbers that make up each of the other six sums. Does each sum equal 42? Yes

1.

15	5	8	14
4	18	11	9
13	7	6	16
10	12	17	3

2–4. In each square below, add to see if you can get 10 equal sums. If you can, it is a magic square: All are magic squares.

2.

13	3	6	12
2	16	9	7
11	5	4	14
8	10	15	1

3.

15	10	3	6
4	5	16	9
14	11	2	7
1	8	13	12

4.

23	33	47	41
45	43	21	35
25	31	49	39
51	37	27	29

Sums: 34 34 144

5–7. Put the missing numbers in each square below so that it will be a magic square. There should be 10 equal sums in each square. In ex. 5, you see that the sum of the numbers in the first column is 38. Find the missing number that will make the first row equal 38. Then find the other missing numbers. Be sure to test your finished square:

5.

13	8	15	2
7	10	5	16
4	17	6	11
14	3	12	9

6.

12	14	19	5
15	9	8	18
6	20	13	11
17	7	10	16

7.

40	26	16	18
14	20	38	28
34	32	10	24
12	22	36	30

Sums: 38 50 100

In ex. 5–7 suggest to pupils that they first find "magic" total for given square and then "compute backwards" from that point to find missing number.

Reteach measures of length (inch, foot, yard, mile) including equivalences and abbreviations. Develop facility in approximating measures.*

Measures of Length

1. The school busses carry children who live several miles from school. Do you know a place that is a mile from school? How long does it take you to walk there? How many feet are there in 1 mile? The abbreviation for mile is **mi.**

2. Learn this table if you do not know it:

Begin class chart of measures.

12 inches (in.) = 1 foot (ft.)
3 feet (ft.) = 1 yard (yd.)
5280 feet (ft.) = 1 mile (mi.)

3. The mile is one of the units for measuring length. You know 3 other units of measure for length. What are they? You should learn to use the right unit of measure. The unit you use depends on the size of the thing you measure. Stress.

Tell what unit of measure you use to find: Emphasize reasonableness of unit used.

4. The length of this book; Inches the width of a room. Feet

5. The distance you ride in a bus; Miles the length of a pencil. Inches

6. The cloth you need for a dress; Yards the width of ribbon. Inches

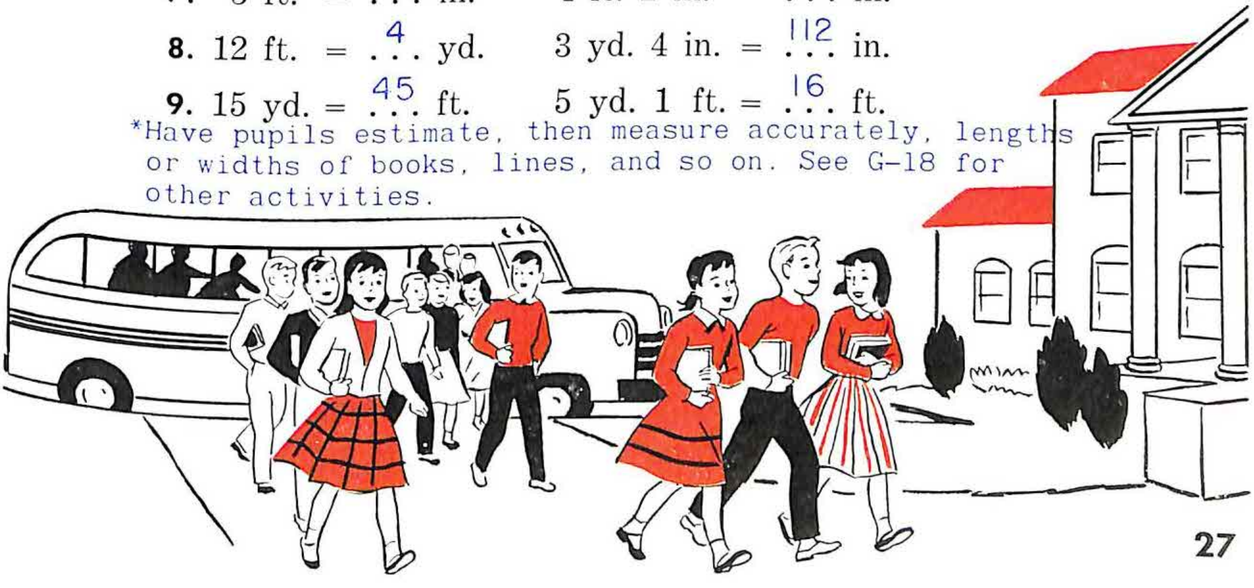
Tell what number should be put in each space:

7. 3 ft. = $\overset{36}{\dots}$ in. 4 ft. 2 in. = $\overset{50}{\dots}$ in.

8. 12 ft. = $\overset{4}{\dots}$ yd. 3 yd. 4 in. = $\overset{112}{\dots}$ in.

9. 15 yd. = $\overset{45}{\dots}$ ft. 5 yd. 1 ft. = $\overset{16}{\dots}$ ft.

*Have pupils estimate, then measure accurately, lengths or widths of books, lines, and so on. See G-18 for other activities.



Review multiplication thought patterns and commutative principle for multiplication.

The School Fair

1. Problem At the school fair popcorn balls sell for 8¢ apiece. Ann has 75 popcorn balls to sell. If she sells all of them, how much money should she have? $6.00

Explanation You must multiply 8¢ by 75. But it is easier to find 8 × 75 and remember that the answer stands for cents. You know that 75 × 8 has the same answer as 8 × 75. The work is shown at the right. 600 stands for cents, so the answer is 600¢, which can be changed to $6.00. Ann should get $6.00 in all.

$$\begin{array}{r} 75 \\ 8 \\ \hline 600 \end{array}$$

2. Betty has 64 popcorn balls to sell at 8¢ each. How much should she get for them? 512¢, or $5.12

3. Jack is selling lemonade at 7¢ a glass. If he sells 120 glasses of lemonade, how much will he get in all? 840¢, or $8.40

4. Tom is selling peanuts at 5¢ a bag. How much will Tom get for 175 bags of peanuts? 875¢, or $8.75

5. Susan sells sticks of candy at 3¢ a stick. How much will she get for 144 sticks? 432¢, or $4.32

Find how much these things will bring:

6. 100 apples at 5¢ each 500¢, or $5.00

7. 125 pears at 8¢ each 1000¢, or $10.00

8. 132 cookies at 3¢ each 396¢, or $3.96

9. 50 candy bars at 6¢ each 300¢, or $3.00

10. 72 lollipops at 4¢ each 288¢, or $2.88

11. 25 sandwiches at 9¢ each 225¢, or $2.25

Discuss ex. 1 fully with pupils, emphasizing commutative principle as applied to larger numbers. In ex. 2-8 remind pupils to change cents to dollars and cents.

Review addition, subtraction, and multiplication examples stated horizontally.

Review Practice

Find the answers:

1. 4577 − 1534 3043 6 × 1493 8958 66 + 84 + 34 184
2. 4364 − 2865 1499 9 × 3985 35,865 83 + 38 + 79 200
3. 3236 − 2468 768 4 × 6234 24,936 69 + 97 + 55 221
4. 1945 − 1287 658 2 × 1427 2854 89 + 78 + 46 213
5. 9000 − 3464 5536 8 × 5162 41,296 96 + 67 + 44 207
6. 6268 − 2696 3572 5 × 2314 11,570 76 + 89 + 35 200
7. 6000 − 4375 1625 7 × 4907 34,349 95 + 97 + 29 221
8. 5463 − 2699 2764 3 × 8921 26,763 59 + 56 + 83 198
9. 2500 − 1986 514 9 × 1726 15,534 95 + 87 + 68 250
10. 4002 − 1257 2745 5 × 5007 25,035 74 + 96 + 79 249
11. 8000 − 7852 148 6 × 2865 17,190 48 + 19 + 96 163
12. 9136 − 7448 1688 8 × 3074 24,592 37 + 94 + 63 194

Try to determine causes of errors. Drill or reteach accordingly.

Do You Know the Right Word?

Review arithmetic vocabulary words.

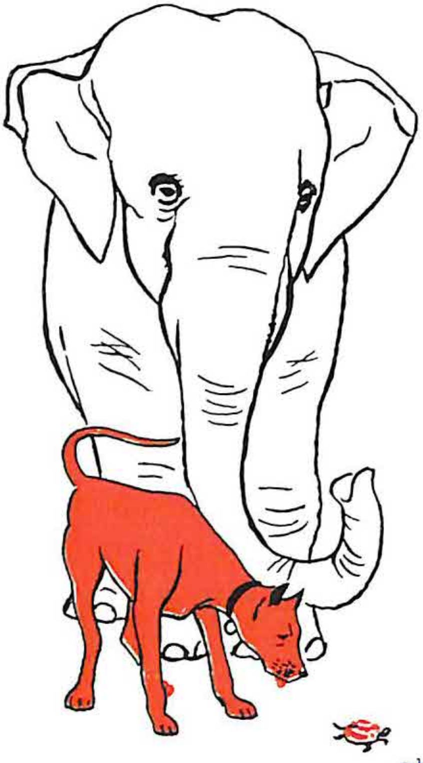
On your paper write the word that goes in each space:

13. The answer to a multiplication example is the . . . product.
14. One of the numbers in a column to be added is an . . . addend.
15. The answer to a subtraction example is the . . . remainder.
16. Another name for the answer in ex. 15 is the . . . difference.
17. The number to be multiplied is the . . . multiplicand.
18. The number to be subtracted is the . . . subtrahend.
19. The answer to an addition example is the . . . sum.
20. The number from which you subtract is the . . . minuend.
21. The number by which you multiply is the . . . multiplier.

Group pupils who need further review of terms. Let others make study cards for them: print term on front of card and illustrate meaning on back (as a label, in an example, and so on).

Reteach measures of weight (ounce, pound, ton) including equivalences and abbreviations.

Measures of Weight



1. You see pictures of three animals of different sizes. These animals are weighed by 3 different units of measure. A large elephant weighs around 5 tons, a very large dog weighs 100 or 150 pounds, and a tiny turtle weighs about 4 ounces. These 3 units measure weight.

2. Learn this table of weight:
Add to class chart (page 27).

16 ounces (oz.) = 1 pound (lb.)
2000 pounds (lb.) = 1 ton (T.)

3. Name 3 things that are measured by the ton, 3 things measured by the pound, and 3 things measured by the ounce. Have pupils make charts showing pictures of objects and unit used.

Find the number that belongs in each space:

4. 3 T. = 6000 lb. 4 lb. = 64 oz. 20 oz. = 1 lb. 4 oz.
5. 5 T. = 10,000 lb. 2 lb. = 32 oz. 25 oz. = 1 lb. 9 oz.
6. $\frac{1}{2}$ T. = 1000 lb. $\frac{1}{2}$ lb. = 8 oz. 19 oz. = 1 lb. 3 oz.

7. Mrs. King bought a piece of cheese that weighed 11 oz. Was this more or less than $\frac{1}{2}$ lb. of cheese? More How many ounces more or less was it? 3 oz. more

8. On a can of fruit Betty read "Net Weight, 14 oz." This means that the fruit alone weighs 14 oz., not including the weight of the can. Is 14 oz. more or less than a pound? 2 oz. less

9. Look at packages of food and cans of fruit and vegetables to find the net weight marked on each one. Write the name and weight for each of 5 packages or cans.

Main objectives are to acquire facility in approximating measures and to know which measure to use in given instance (ex. 1, 3). Give children opportunity to estimate weights of pupils or objects in class, then measure accurately.

Present diagnostic test of mastery of division facts.

The Even Division Facts

This is a test on the division facts. You should be able to give all the answers orally within the time stated by your teacher:

1. $\overset{3}{3\overline{)9}}$ $\overset{1}{1\overline{)1}}$ $\overset{7}{7\overline{)49}}$ $\overset{7}{9\overline{)63}}$ $\overset{4}{5\overline{)20}}$ $\overset{2}{4\overline{)8}}$

2. $\overset{5}{1\overline{)5}}$ $\overset{0}{8\overline{)0}}$ $\overset{7}{6\overline{)42}}$ $\overset{2}{7\overline{)14}}$ $\overset{3}{4\overline{)12}}$ $\overset{0}{6\overline{)0}}$

3. $\overset{1}{4\overline{)4}}$ $\overset{7}{1\overline{)7}}$ $\overset{5}{3\overline{)15}}$ $\overset{3}{6\overline{)18}}$ $\overset{9}{8\overline{)72}}$ $\overset{9}{5\overline{)45}}$

4. $\overset{0}{1\overline{)0}}$ $\overset{3}{2\overline{)6}}$ $\overset{6}{9\overline{)54}}$ $\overset{8}{3\overline{)24}}$ $\overset{5}{7\overline{)35}}$ $\overset{7}{4\overline{)28}}$

5. $\overset{4}{1\overline{)4}}$ $\overset{1}{5\overline{)5}}$ $\overset{8}{2\overline{)16}}$ $\overset{8}{6\overline{)48}}$ $\overset{9}{4\overline{)36}}$ $\overset{5}{8\overline{)40}}$

6. $\overset{4}{2\overline{)8}}$ $\overset{0}{4\overline{)0}}$ $\overset{7}{8\overline{)56}}$ $\overset{4}{4\overline{)16}}$ $\overset{9}{9\overline{)81}}$ $\overset{4}{3\overline{)12}}$

7. $\overset{2}{1\overline{)2}}$ $\overset{1}{9\overline{)9}}$ $\overset{5}{5\overline{)25}}$ $\overset{6}{3\overline{)18}}$ $\overset{4}{6\overline{)24}}$ $\overset{9}{7\overline{)63}}$

8. $\overset{0}{2\overline{)0}}$ $\overset{2}{2\overline{)4}}$ $\overset{3}{9\overline{)27}}$ $\overset{4}{8\overline{)32}}$ $\overset{6}{2\overline{)12}}$ $\overset{7}{5\overline{)35}}$

9. $\overset{0}{9\overline{)0}}$ $\overset{1}{3\overline{)3}}$ $\overset{2}{5\overline{)10}}$ $\overset{6}{4\overline{)24}}$ $\overset{6}{7\overline{)42}}$ $\overset{5}{9\overline{)45}}$

10. $\overset{0}{7\overline{)0}}$ $\overset{9}{1\overline{)9}}$ $\overset{2}{8\overline{)16}}$ $\overset{5}{6\overline{)30}}$ $\overset{7}{2\overline{)14}}$ $\overset{3}{5\overline{)15}}$

11. $\overset{2}{3\overline{)6}}$ $\overset{1}{8\overline{)8}}$ $\overset{3}{7\overline{)21}}$ $\overset{8}{5\overline{)40}}$ $\overset{2}{9\overline{)18}}$ $\overset{9}{6\overline{)54}}$

12. $\overset{1}{2\overline{)2}}$ $\overset{3}{1\overline{)3}}$ $\overset{5}{2\overline{)10}}$ $\overset{9}{3\overline{)27}}$ $\overset{6}{6\overline{)36}}$ $\overset{8}{8\overline{)64}}$

13. $\overset{0}{3\overline{)0}}$ $\overset{1}{6\overline{)6}}$ $\overset{5}{4\overline{)20}}$ $\overset{8}{9\overline{)72}}$ $\overset{9}{2\overline{)18}}$ $\overset{8}{7\overline{)56}}$

14. $\overset{8}{1\overline{)8}}$ $\overset{0}{5\overline{)0}}$ $\overset{2}{6\overline{)12}}$ $\overset{7}{3\overline{)21}}$ $\overset{3}{8\overline{)24}}$ $\overset{6}{5\overline{)30}}$

15. $\overset{1}{7\overline{)7}}$ $\overset{6}{1\overline{)6}}$ $\overset{6}{8\overline{)48}}$ $\overset{4}{7\overline{)28}}$ $\overset{8}{4\overline{)32}}$ $\overset{4}{9\overline{)36}}$

To the Teacher. See the suggestions on page 327 for giving this diagnostic test on the fundamental division facts.

See G-10 for oral presentation of test. Note errors or hesitancy on progress cards and group pupils for reteaching and/or drill (construct flash cards). See G-111, 112 for suggested games and aids.

Reteach relationship which exists between division and multiplication. Help in remembering facts is based on idea that division is the inverse operation of multiplication.

How to Help Yourself

1. You have learned the multiplication facts so that you can give the products quickly. These facts will help you if you forget any of the division facts. The multiplication fact $4 \times 5 = 20$ tells you that four 5's make 20. The division fact $5\overline{)20}$ asks you how many 5's make 20. It is easy to answer the question, "How many 5's make 20?" if you know that $4 \times 5 = 20$. You see that if you know the multiplication facts well, you should have no trouble with the division facts. Emphasize.

2. If you did not know the answers to all the division facts on page 31, first go over page 5 again to discover the multiplication facts that trouble you. After you have mastered these multiplication facts, try the division facts on page 31 again.

3. If you forget the answer to the division fact $6\overline{)42}$, ask the question, "How many 6's make 42?" If you remember that $7 \times 6 = 42$, you know that $6\overline{)42}$ is 7.

Tell the number to put in each space:

4. $7\overline{)35}$ equals . 5 . because . 5 . 7's make 35.

5. $9\overline{)45}$ equals . 5 . because . 5 . 9's make 45.

6. $6\overline{)54}$ equals . 9 . because . 9 . 6's make 54.

7. $3\overline{)27}$ equals . 9 . because . 9 . 3's make 27.

8. $8\overline{)32}$ equals . 4 . because . 4 . 8's make 32.

9. $4\overline{)24}$ equals . 6 . because . 6 . 4's make 24.

10. $7\overline{)56}$ equals . 8 . because . 8 . 7's make 56.

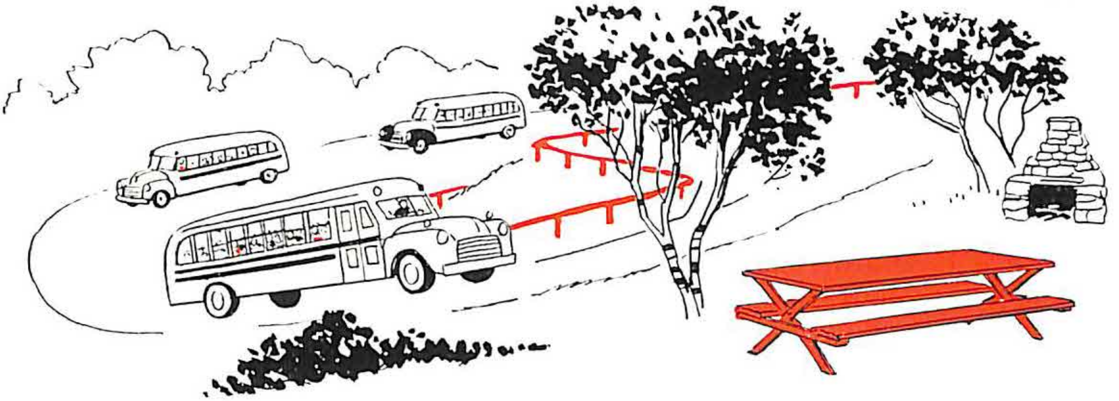
11. $9\overline{)63}$ equals . 7 . because . 7 . 9's make 63.

12. $5\overline{)40}$ equals . 8 . because . 8 . 5's make 40.

13. $8\overline{)72}$ equals . 9 . because . 9 . 8's make 72.

Extend work in ex. 4-13 to include other facts. Reinforce relationship by quiz activity. Ask pupils for two facts about 5 whose product is 45 and whose dividend is 45 (do same for other facts).

Reteach division by 1-figure numbers with no remainders.



How Well Can You Divide?

Introduce division terms and add them to chart (page 8).

1. Problem There are 246 children who will ride to the school picnic in 6 school busses. If the same number ride in each bus, how many should there be in each one? 41 children

Explanation Divide 246 by 6 like this:

You cannot divide 2 hundreds by 6 but you can change 2 hundreds to 20 tens. Then you have 24 tens. You can now divide 24 tens by 6. Think, "24 ÷ 6 = 4." Write 4 over the 4 of 24 to show that you have divided 24 tens. Then think, "6 ones ÷ 6 = 1 one." Write 1 over 6 ones. The answer is 41. There should be 41 children in each bus. Check by multiplying 41 by 6. This gives 246, so the answer is right.

$$\begin{array}{r}41\\6\overline{)246}\end{array}$$

Check

$$\begin{array}{r}41\\6\\\hline 246\end{array}$$

In the work above, 6 is the **divisor,** 246 is the **dividend,** and 41 is the **quotient.** Learn these new words.

Check based on fact that division is the inverse operation of multiplication.

Divide and check your work:

2.	$\begin{array}{r}22\\4\overline{)88}\end{array}$	$\begin{array}{r}32\\2\overline{)64}\end{array}$	$\begin{array}{r}13\\3\overline{)39}\end{array}$	$\begin{array}{r}50\\5\overline{)250}\end{array}$	$\begin{array}{r}81\\4\overline{)324}\end{array}$	$\begin{array}{r}51\\6\overline{)306}\end{array}$
3.	$\begin{array}{r}10\\9\overline{)90}\end{array}$	$\begin{array}{r}32\\3\overline{)96}\end{array}$	$\begin{array}{r}12\\4\overline{)48}\end{array}$	$\begin{array}{r}80\\8\overline{)640}\end{array}$	$\begin{array}{r}80\\5\overline{)400}\end{array}$	$\begin{array}{r}21\\9\overline{)189}\end{array}$
4.	$\begin{array}{r}43\\2\overline{)86}\end{array}$	$\begin{array}{r}11\\7\overline{)77}\end{array}$	$\begin{array}{r}12\\3\overline{)36}\end{array}$	$\begin{array}{r}91\\5\overline{)455}\end{array}$	$\begin{array}{r}201\\4\overline{)804}\end{array}$	$\begin{array}{r}93\\2\overline{)186}\end{array}$
5.	$\begin{array}{r}20\\3\overline{)60}\end{array}$	$\begin{array}{r}10\\8\overline{)80}\end{array}$	$\begin{array}{r}10\\5\overline{)50}\end{array}$	$\begin{array}{r}83\\3\overline{)249}\end{array}$	$\begin{array}{r}81\\7\overline{)567}\end{array}$	$\begin{array}{r}30\\6\overline{)180}\end{array}$
6.	$\begin{array}{r}22\\2\overline{)44}\end{array}$	$\begin{array}{r}11\\6\overline{)66}\end{array}$	$\begin{array}{r}14\\2\overline{)28}\end{array}$	$\begin{array}{r}101\\6\overline{)606}\end{array}$	$\begin{array}{r}70\\3\overline{)210}\end{array}$	$\begin{array}{r}70\\5\overline{)350}\end{array}$

Discuss ex. 1 carefully with pupils. Be sure they understand "why" and "how" 2 hundreds are changed to 20 tens. Stress proper placement of quotient figures and reasons for this (place value).

Emphasize relationship between multiplication and division (ex. 1-5). Reteach basic uneven division facts: see G-20 for discussion. Add new term to vocabulary chart.

Finding the Missing Factor

1. In the multiplication fact 4 × 6 = 24, the numbers 4 and 6 are factors of 24.

2. If you know that one of two factors which have the product 30 is 6, the division fact $6\overline{)30}$ tells you that the other factor is 5. To find the unknown factor, you can divide the product by the known factor.

Find the missing factor:

3. 4 × . 7 . = 28 . 9 . × 8 = 72 7 × . 6 . = 42
4. 2 × . 12 . = 24 . 11 . × 4 = 44 3 × . 21 . = 63
5. 3 × . 43 . = 129 . 41 . × 5 = 205 8 × . 21 . = 168

Reteach basic uneven division facts: see G-20 for discussion. Add new term to vocabulary chart.

Remainders in Division

6. **Problem** On the radio Ann heard the man say, "Only 65 days until Christmas." She wondered how many weeks that was, so she divided 65 by 7.

Explanation To find Ann's answer, think, "There are nine 7's in 65." Write 9 above the 5 of 65. Then multiply 7 by 9, which gives 63, and subtract 63 from 65. This leaves 2. 2 is called the **remainder;** 9 is called the **quotient.** The answer is 9 R2. This means there are 9 weeks and 2 days until Christmas.

$$\begin{array}{r} 9 \\ 7\overline{)65} \\ \underline{63} \\ 2 \end{array}$$

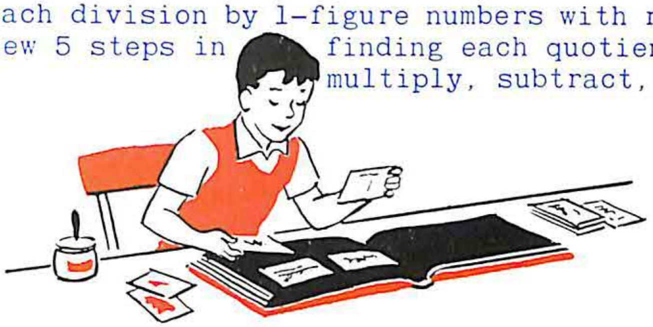
Divide as in ex. 6 and find the quotients and remainders:

7. $5\overline{)31}$ 6R1 $2\overline{)15}$ 7R1 $8\overline{)20}$ 2R4 $6\overline{)15}$ 2R3 $3\overline{)28}$ 9R1 $7\overline{)25}$ 3R4 $9\overline{)15}$ 1R6
8. $8\overline{)47}$ 5R7 $9\overline{)60}$ 6R6 $4\overline{)18}$ 4R2 $5\overline{)24}$ 4R4 $7\overline{)60}$ 8R4 $4\overline{)11}$ 2R3 $6\overline{)40}$ 6R4
9. $7\overline{)65}$ 9R2 $5\overline{)42}$ 8R2 $6\overline{)45}$ 7R3 $8\overline{)50}$ 6R2 $3\overline{)20}$ 6R2 $2\overline{)17}$ 8R1 $8\overline{)57}$ 7R1

More Practice. See ③ on page 311. Use for reinforcement.

Give further review and drill on these and other facts, using flash cards, games, number wheel, and so on. Remind pupils of "helping numbers" (next smaller number that can be divided evenly).

Reteach division by 1-figure numbers with remainders and carrying. Review 5 steps in finding each quotient figure (divide, multiply, subtract, compare, bring down).



More Division

1. Problem Jack has 75 new post cards to put in his book. He puts 4 cards on each page. How many full pages of new post cards will he have? 18 R3

$$\begin{array}{r} 18\text{ R3} \\ 4\overline{)75} \\ \underline{4} \\ 35 \\ \underline{32} \\ 3 \end{array}$$

Explanation Divide 75 by 4 like this:

Think, "7 tens ÷ 4 = 1 ten with 3 over." Write 1 over 7 tens and multiply 4 by 1. This gives 4. Subtract 4 from 7 and you have 3, which is less than the divisor. Bring down 5 ones. Think, "35 ones ÷ 4 = 8 ones with 3 over." Write 8 over 5 ones. The quotient is 18 and there is a remainder of 3. Jack will have 18 full pages and 3 cards on another page.

2. Study these division examples carefully:

$$\begin{array}{r} 65 \\ 7\overline{)455} \\ \underline{42} \\ 35 \\ \underline{35} \end{array} \qquad \begin{array}{r} 19\text{ R1} \\ 5\overline{)96} \\ \underline{5} \\ 46 \\ \underline{45} \\ 1 \end{array} \qquad \begin{array}{r} 90\text{ R3} \\ 8\overline{)723} \\ \underline{72} \\ 3 \\ \underline{0} \\ 3 \end{array} \qquad \begin{array}{r} 81\text{ R2} \\ 6\overline{)488} \\ \underline{48} \\ 8 \\ \underline{6} \\ 2 \end{array}$$

Find quotients and remainders: Use long form.

3.	14 4)56	18 3)54	86R5 7)607	96 2)192	68 6)408	59 8)472
4.	18 5)90	20R2 4)82	57 6)342	81R7 8)655	67R2 9)605	75 3)225
5.	29R1 3)88	14R1 6)85	49 5)245	14 8)112	37 4)148	57R1 7)400
6.	47R1 2)95	15R2 5)77	56R1 4)225	49 7)343	90R5 6)545	83R1 2)167
7.	13 7)91	10R5 9)95	27 8)216	38 9)342	36R2 8)290	92R2 9)830

Discuss ex. 1-2 with pupils, emphasizing place value of figures, reasons for exchange of tens, placement of quotient figures. Some pupils may need more practice on uneven facts (see page 34).

Oral Review

1. Divide each number by 6:
36 6 54 9 18 3 42 7 30 5 48 8 13 2R1 20 3R2

2. Divide each number by 9:
18 2 63 7 45 5 27 3 81 9 54 6 36 4 10 1R1

3. Give the answers to the 90 division facts on page 31.

4. Give the next five numbers above 9997. 9998, 9999, 10,000, 10,001, 10,002

5. Add 7 to each number.(1) Add 5;(2) add 8;(3) add 6:(4)
(1), (2) 36,34 63,61 91,89 25,23 42,40 77,75 54,52 70,68
(3), (4) 29 37,35 56 64,62 84 92,90 18 26,24 35 43,41 70 78,76 47 55,53 63 71,69

6. Multiply each number by 6 and add 4 to the product:
2 16 5 34 0 4 7 46 9 58 4 28 8 52 3 22 6 40

7. Multiply each number by 9 and add 5 to the product:
8 77 4 41 9 86 1 14 6 59 3 32 7 68 0 5 5 50

8. 4 dimes, 2 nickels, and 2 pennies = 52¢.

9. 2 quarters, 1 dime, 3 nickels, 4 pennies = 79¢.

10. 1 quarter, 3 dimes, 2 nickels, 9 pennies = 74¢.

11. Give the answers to the subtraction facts on page 12.

12. Subtract 5 from each number.(1) Subtract 10:(2)
(1) 89 84 47 42 18 13 35 30 86 81 50 45 94 89 73 68
(2) 79 37 8 25 76 40 84 63

13. Make change from $1.00 for things that cost:
52¢ 53,54,55,65,75,$1.00 19¢ 20,25,50,$1.00 39¢ 40,50,$1.00 41¢ 42,43,44,45,50,$1.00 78¢ 79,80,90,$1.00 35¢ 40,50,$1.00 63¢ 64,65,75,$1.00

Look at a clock face and tell how many minutes from

14. 11:30 to 11:45 15 8:25 to 9:11 46
15. 10:05 to 10:30 25 5:13 to 5:41 28
16. 10:50 to 11:15 25 6:28 to 7:03 35
17. 12:06 to 12:33 27 3:46 to 4:38 52
18. 11:57 to 12:40 43 1:25 to 2:10 45

Conduct review as quiz program, letting different pupils act as quiz master. Spot-check for class or individual weaknesses and reteach or drill accordingly.

Reteach and extend division of 4-figure numbers.

Larger Quotients

1. Problem Six girls gave a Halloween party. It cost \$17.12 all together. The girls shared the cost equally. How much did each one pay? \$2.85 R2¢

Explanation You divide as you did on page 35. This time there are three figures in the quotient. Stress. → The decimal point in the quotient should be put over the decimal point in the dividend. The quotient is \$2.85 and the remainder is 2¢. Each girl paid \$2.85 and two of the girls each paid 1¢ extra.

$$\begin{array}{r} \$2.85\text{ R}2¢ \\ 6\overline{)\$17.12} \\ \underline{12} \\ 5\,1 \\ \underline{4\,8} \\ 32 \\ \underline{30} \\ 2 \end{array} \qquad \begin{array}{r} \$2.85 \\ \underline{6} \\ \$17.10 \\ \underline{.02} \\ \$17.12 \end{array}$$

Stress. → To check the work, multiply the quotient by the divisor and add the remainder to the product. The result should equal the dividend.

Divide and check your work:

2.	$\begin{array}{r} 873 \\ 6\overline{)5238} \end{array}$	$\begin{array}{r} 169 \\ 9\overline{)1521} \end{array}$	$\begin{array}{r} 488 \\ 5\overline{)2440} \end{array}$	$\begin{array}{r} 516 \\ 8\overline{)4128} \end{array}$	$\begin{array}{r} \$\,9.15\text{R}2¢ \\ 7\overline{)\$64.07} \end{array}$
3.	$\begin{array}{r} 237\text{R}5 \\ 8\overline{)1901} \end{array}$	$\begin{array}{r} 419 \\ 3\overline{)1257} \end{array}$	$\begin{array}{r} 248 \\ 7\overline{)1736} \end{array}$	$\begin{array}{r} 415 \\ 6\overline{)2490} \end{array}$	$\begin{array}{r} \$\,1.32 \\ 9\overline{)\$11.88} \end{array}$
4.	$\begin{array}{r} 732 \\ 5\overline{)3660} \end{array}$	$\begin{array}{r} 968\text{R}1 \\ 2\overline{)1937} \end{array}$	$\begin{array}{r} 806 \\ 6\overline{)4836} \end{array}$	$\begin{array}{r} 625 \\ 3\overline{)1875} \end{array}$	$\begin{array}{r} \$\,5.28 \\ 4\overline{)\$21.12} \end{array}$
5.	$\begin{array}{r} 697 \\ 4\overline{)2788} \end{array}$	$\begin{array}{r} 376 \\ 7\overline{)2632} \end{array}$	$\begin{array}{r} 756 \\ 2\overline{)1512} \end{array}$	$\begin{array}{r} 314 \\ 4\overline{)1256} \end{array}$	$\begin{array}{r} \$\,8.25 \\ 9\overline{)\$74.25} \end{array}$
6.	$\begin{array}{r} 740\text{R}2 \\ 9\overline{)6662} \end{array}$	$\begin{array}{r} 290\text{R}5 \\ 6\overline{)1745} \end{array}$	$\begin{array}{r} 409\text{R}3 \\ 8\overline{)3275} \end{array}$	$\begin{array}{r} 916 \\ 5\overline{)4580} \end{array}$	$\begin{array}{r} \$\,7.83\text{R}1¢ \\ 3\overline{)\$23.50} \end{array}$

See page 35 for suggestions for discussion of ex. 1. Have pupils explain work in ex. 2-6, giving reasons for placement of quotient figures, exchange of thousands for hundreds, or dollars for dimes, and so on.

Reteach six thought patterns in division.

Helps in Division Problems

You use division to separate a group of things into smaller equal groups. You also use it to find how many smaller groups of a certain size there are in a larger group.

1. There are 120 children who will do square dances. Eight children dance in each set. How many sets will there be? 15
2. Susan sells 6 greeting cards in a package. How many packages can she make from 144 cards? 24

Suppose you know how many there are in all. You also know how many are to be in each group. To find how many groups you can make, you should divide.

3. How many 6-cent candy bars can Jim buy with a quarter? 4 How much money will he have left? 1¢
4. Mr. Chase spent 84¢ for stamps at 3¢ each. How many stamps did he get? 28

Suppose you know how much money you can spend for several of the same things. You also know the price of one thing. To find how many of these things you can buy, you should divide.

5. Our fourth grade gave a play yesterday. Some of the boys put 45 chairs in 5 equal rows. How many chairs were there in each row? 9

Pupils should not memorize thought patterns, but should understand and be able to recognize them. Check this by having pupils make up own problems illustrating the different patterns.

6. Mary packed 72 cookies in 3 boxes. She put the same number of cookies in each box. How many cookies were there in each box? 24

Suppose you put a number of things into several equal groups. To find how many there are in each group, you can divide.

7. Father gave Ann and Tom \$5.00 to divide equally. How much did each one get? \$2.50

8. Three boys caught 21 fish all together. They shared the fish equally. How many fish did each boy get? 7

Suppose things are shared equally by several children. To find each child's share, you can divide.

9. Mrs. Hunt paid \$2.85 for 3 yd. of cloth. Find the cost of 1 yd. of this cloth. \$.95

10. Mary Ann paid 42¢ for 6 oranges. What was the cost of 1 orange? 7¢

Suppose you know the cost of two or more of the same things. To find the cost of one thing, you can divide.

11. Make a division problem about sharing the cost of a birthday present for someone.

12. Make a division problem about finding how many groups you can make from a certain number of children who want to play the same game.

Some pupils may need further examples illustrating these patterns. Work with them, while others make up original problems for scrapbooks or arithmetic corner.

Review 1-figure multiplication and division.

Problems and Practice

1. Don and Bob cleaned up Mr. West's yard. They worked 5 hr. and together got $.90 an hour. How much money did the boys earn? $4.50

2. The boys shared equally the money they earned in ex. 1. How much did each boy get? $2.25

3. Bob put all but $.75 of his money in the bank. How much did Bob put in the bank? See ex. 2. $1.50

4. Don is saving his money for new bicycle tires. He needs 2 tires that cost $2.75 apiece. How much does Don need to spend for tires? $5.50

Multiply and check your work:

5.	87	263	619	406	1483	$6.25	$12.37
	4	9	3	5	7	6	8
	348	2367	1857	2030	10,381	$37.50	$98.96
6.	49	450	387	564	3106	$8.95	$25.67
	6	3	5	8	4	9	7
	294	1350	1935	4512	12,424	$80.55	$179.69

Find quotients and remainders. Check the work:

7.	96 R1 4)385	59 R3 7)416	297 R4 8)2380	659 2)1318	$ 4.53 6)$27.18
8.	84 9)756	38 R2 5)192	548 4)2192	406 8)3248	$ 9.87 3)$29.61
9.	69 R5 6)419	80 R1 2)161	372 7)2604	647 5)3235	$ 3.75 R5¢ 9)$33.80

10. Find the product of 7 and 2396. 16,772

11. Find the quotient when 1395 is divided by 3. 465

12. Find the quotient when $22.00 is divided by 8. $2.75

More Practice. See ④ on page 311. Use for individual assistance.

Use this review as preparation for diagnostic test. Note errors and evidences of frustration on progress cards. Group pupils for reteaching (emphasize meanings) or drill as needed.

Provide diagnostic test of skills, concepts, vocabulary. Urge pupils to use this as self-test: mark own papers and set up own remedial work.

Testing Yourself

Do your work carefully. The number in the circle following each exercise tells the score for that exercise.

Multiply and check:

1. ㉔

275	490	958	618	3025	1294
3	7	8	5	9	6
825	3430	7664	3090	27,225	7764

Divide and check:

2. ⑳

873	409R4	629	715R3	850R8
5)4365	7)2867	4)2516	8)5723	9)7658

3. In ex. 1, find a number that is a multiplier and write it on your paper. Then find and write one that is a multiplicand. Write the name of a number that is an answer in multiplication. ⑨

4. Find the quotient when 3000 is divided by 4. 750 ⑤

5. Look at ex. 4 to answer this. Write the name of 3000; Dividend then write the name of 4. Divisor ⑥

6. What is the product of 8 and 5280? 42,240 ⑤

7. Find the quotient and remainder: 2743 ÷ 6. 457 RI ⑤

8. Find the cost of 576 pencils at 4¢ each. 2304¢, or $23.04 ⑤

9. How many 9's are there in 3933? 437 ⑤

10. Last week there was a school fair. After all the bills were paid there was $127.20 left. Six classes shared this money equally. How much did each class get? $21.20 ⑧

11. Our class bought 6 new music records at $2.95 each. How much did these records cost? $17.70 ⑧

See G-22 for correlation of examples with aims.

Chapter Review

Give the answers: Remind pupils to watch signs in ex. 1-7.

1. 27 + 2 29   39 + 4 43   18 + 7 25   75 + 6 81   45 + 5 50
2. 63 + 7 70   90 + 8 98   54 + 9 63   46 + 8 54   79 + 3 82
3. 36 − 5 31   57 − 7 50   89 − 4 85   26 − 3 23   68 − 5 63
4. 50 − 6 44   80 − 4 76   32 − 7 25   51 − 8 43   43 − 9 34

Copy, add or subtract, and check:

5. 763 + 516 + 383 + 429 2091   6483 − 3529 2954   7294 + 918 8212
6. 557 + 264 + 534 + 108 1463   2225 − 1947 278   4875 + 125 5000
7. 832 + 649 + 185 + 334 2000   7000 − 2845 4155   1999 + 476 2475

Find the numbers that go in the spaces:

8. 3 lb. = 48 oz.   6 ft. = 2 yd.   6 yd. = 18 ft.
9. 2 mi. = 10,560 ft.   8 yd. = 288 in.   2 lb. = 32 oz.
10. 9 ft. = 108 in.   5 T. = 10,000 lb.   3 T. = 6000 lb.

11. Jack spent $6.19 at the store. He gave the man $10.00. How much change did Jack get? $3.81

Multiply these numbers and check the work:

12.	297	356	178	189	3586	1798	3951
	4	9	8	6	2	9	7
	1188	3204	1424	1134	7172	16,182	27,657
13.	534	675	709	608	2004	2873	2697
	8	3	6	4	7	5	8
	4272	2025	4254	2432	14,028	14,365	21,576

Find quotients and remainders, if any. Check: Stress.

14. $6\overline{)4415}$ 735R5 $8\overline{)1979}$ 247R3 $3\overline{)1401}$ 467 $9\overline{)2945}$ 327R2 $2\overline{)1978}$ 989
15. $5\overline{)1620}$ 324 $9\overline{)7245}$ 805 $7\overline{)2008}$ 286R6 $4\overline{)1523}$ 380R3 $8\overline{)4152}$ 519
16. $7\overline{)4179}$ 597 $6\overline{)5436}$ 906 $4\overline{)3180}$ 795 $5\overline{)4482}$ 896R2 $9\overline{)6246}$ 694

Help pupils to analyze own errors by having them do computations orally. Let others work at arithmetic corner on puzzles, projects, magic squares, and so on.

A Problem Test

1. Jim bought a 15-cent notebook, a 6-cent pencil, a 7-cent red pencil, a 75-cent ball-point pen, and a 29-cent tube of paste. How much money did Jim spend? 132¢, or $1.32

2. Today 283 children in Park School brought 5¢ apiece for milk. How much money did they bring? 1415¢, or $14.15

3. Ann bought a piece of cheese that weighed 22 oz. How much more or less than a pound did the cheese weigh? 6 oz. more

4. Don saved $18.45 toward a bicycle. Jim saved $20.60 toward one. How much less did Don save than Jim? $2.15

5. Jane gave the man a half dollar to pay for a 33-cent tube of tooth paste. The man gave her 2 pennies, 1 nickel, and 1 dime. Was this the right change? Yes

6. Mrs. Fellows bought 4 yd. of cloth and paid $3.56 for it. How much did 1 yd. of cloth cost? $.89

7. A set of children's books costs $19.95. This year 3 schools in Fairfield will each have a set of these books. How much will the 3 sets of books cost? $59.85

8. At a sale Bob's father bought Bob a new suit for $15.59. Before the sale the suit cost $18.50. How much did Bob's father save by buying the suit at a sale? $2.91

9. Today Susan made 132 pieces of candy and sold it in bags with 8 pieces in a bag. How many bags did Susan sell today? 16 Did she have any pieces left for herself? 4

10. In 3 schools there are 386 children, 425 children, and 512 children. How many children are there in all 3 schools? 1323

How many problems did you get right? Look below to find out what your score means. Have pupils begin own charts of problem-test scores to use to compare with later scores.

SCORE	0–5	6–7	8–9	10
	You need help	Fair	Good	Excellent

Allow pupils ample time to do this work. Urge them to read carefully to determine what is asked, facts known, process to use, how to write problem in numerical form. Have pupils record scores on charts.

Present diagnostic tests of skills retaught, with practice-page references.

How Much Have You Learned?

If you miss more than one example in any row, turn to the Practice Page for that row.

Add these numbers and check the work: Stress checking.

						Practice Pages
1.	79 82 15 37 213	663 256 589 341 1849	235 454 287 925 1901	3366 2342 1808 1077 8593	1559 1439 2141 1236 6375	8

Subtract these numbers and check the work:

2.	884 647 237	719 454 265	125 98 27	9734 7869 1865	5245 4755 490	14
3.	900 486 414	500 293 207	600 365 235	7000 3354 3646	2007 1278 729	14

Multiply these numbers and check the work:

4.	78 8 624	473 6 2838	680 5 3400	1325 9 11,925	$10.83 7 $75.81	24
5.	97 4 388	648 9 5832	574 2 1148	2065 8 16,520	$72.49 3 $217.47	24

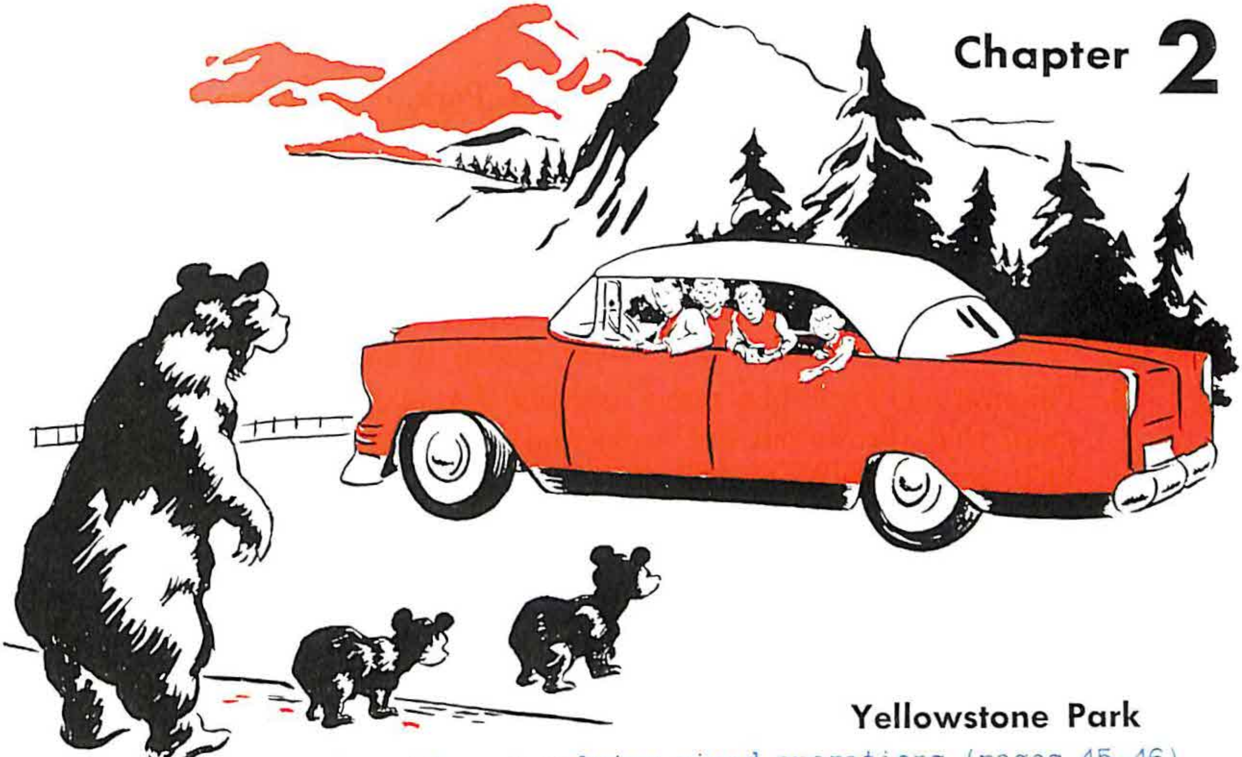
Divide and check. Write R before remainders: Stress.

6.	9R3 8)75	4R2 3)14	4R5 9)41	3R4 5)19	34
7.	6R4 7)46	7R3 4)31	9R5 6)59	8R3 8)67	34
8.	73 3)219	201 4)804	81 5)405	90 8)720	33
9.	49 6)294	57R1 7)400	63R3 9)570	45 5)225	35
10.	504 9)4536	795 2)1590	$ 2.75 7)$19.25	$ 3.18R2¢ 8)$25.46	37

Compare results of test with previous ones as noted on progress cards. Urge pupils to make own self-assignments from practice pages.

See G-24 for specific aims of Chapter 2.

Chapter 2



Yellowstone Park

Present word problems involving mixed operations (pages 45–46).

1. Last summer Betty and Bill White went to Yellowstone Park. The Park is 1378 mi. west of Grand City where the Whites live. They drove to the Park in their car. How many miles was the trip from Grand City to the Park and back home again? 2756

2. The children learned that the first white man saw this land about 1807. The land was finally explored in 1870. It was opened as the first National Park in 1872. How many years after it was discovered was the land opened as a park? 65

3. Yellowstone Lake is the highest large lake in North America. It is 7731 ft. above sea level. How many feet more than 1 mi. above sea level is Yellowstone Lake? 2451

4. The shore line of Yellowstone Lake is about 100 mi. long. Bill likes to walk around Blue Lake at home. He can go around Blue Lake in 2 hr. at 4 mi. an hour. If he could walk around the shore of Yellowstone Lake at 4 mi. an hour, how many hours would it take? 25

Motivate lesson through discussion of pupils' visits to, or knowledge of, Yellowstone Park. Let them bring in and discuss pictures they may have. In doing problems, have children give reasons for processes used.

Yellowstone Park

1. Yellowstone River flows through the Park. There are two high falls near together on the river. The Upper Falls is 112 ft. high and the Lower Falls is 308 ft. high. How many feet higher is the Lower Falls than the Upper Falls? 196

2. In the Park are 300 mi. of roads and 900 mi. of trails. How many times the number of miles of roads is the number of miles of trails? 3

3. Yellowstone Park has many geysers. A geyser is a waterspout that throws out hot water and steam. There are about 3000 geysers, hot springs, and pools in the Park. Is 3000 an exact number or a round number? Round

4. It was not until 1915 that automobiles were allowed in Yellowstone Park. How many years ago was that?

5. The main season to visit Yellowstone Park is from about June 20 to September 10. Look at a calendar and see how many weeks and days this is. 11 wk. 6 da.

6. Try to get a book about Yellowstone Park from the library. You will be interested to read about it, and some day you may visit the Park.

Ex. 1 A illustrates fact that multiplication is distributive with respect to addition, i.e., 32 × 75 = (2 + 30) (75) = 2 (75) + 30 (75).

Multiplying by a 2-Place Number

1. **Problem** There are 32 Cub Scouts collecting old paper. Each one is trying to get 75 lb. How many pounds of old paper will that be? 2400 Will they have as much as 1 T. of old paper? Yes

Explanation You do the work as shown at the right. Multiply 75 by 2 and write 150 so that the 0 comes under the 2 by which you multiply. Multiply 75 by 3 and write 225 so that the 5 comes under the 3 by which you multiply. This last product is really 2250 because you have multiplied by 3 tens, or 30, as shown at A. Drop the 0 and write only 225, as shown at B; this makes the work shorter. Add the two products as they stand in B, which gives 2400.

A	B
75	75
32	32
150	150
2250	225
2400	2400

2400 is the **product** of 75 and 32. 150 and 225 are called **partial products.** Tell the name of 75; of 32.

Emphasize

Add new words to vocabulary chart

You can check the work by going over it.

2. Study these examples carefully: Have pupils explain absence of zero.

68	45	246	943
19	47	23	81
612	315	738	943
68	180	492	7544
1292	2115	5658	76383

In ex. 3-5 let pupils use method A if they wish.

Multiply as shown above. Check by going over your work:

3.	52	78	46	458	539	817	764
	38	65	37	27	36	13	92
	1976	5070	1702	12,366	19,404	10,621	70,288
4.	93	56	92	237	769	508	164
	25	56	79	84	18	49	54
	2325	3136	7268	19,908	13,842	24,892	8856
5.	98	63	80	175	354	197	838
	93	42	36	76	27	68	29
	9114	2646	2880	13,300	9558	13,396	24,302

In discussing ex. 1 be sure pupils understand place value of partial products and why partial product of tens multiplier is set over to left (since multiplier is tens).

Extend multiplication by 2-figure numbers to dollars and cents. Stress fact that answer must be in dollars and cents. Do ex. 1-4 with class.

Problems and Practice

1. A bus ticket to Sandy Beach costs $1.35. If 43 people rode there in the bus, how much money in all did they pay? $58.05

   ▶ Remember that you multiply dollars and cents the same way you multiply other numbers. Be sure to place the decimal point before the last two figures of the answer. Emphasize.

2. Last month Mr. Wells sold 54 sweaters at $4.95 each. How much did he get for all these sweaters? $267.30

3. There are 36 packages of seeds in a box. The children in Hilltop School sold 18 boxes of these seeds last spring. How many packages of seeds did they sell? 648

4. Our class sold 86 tickets for the school play at $.75 apiece. How much did we have from the sale of these tickets? $64.50

Have pupils explain work in ex. 5-10; check place-value understandings.

Multiply. Check by going over your work:

5.	48 91 4368	38 12 456	71 47 3337	70 98 6860	978 43 42,054	$2.16 37 $79.92	$3.52 29 $102.08
6.	83 78 6474	40 35 1400	52 19 988	95 46 4370	649 67 43,483	$2.64 45 $118.80	$2.76 26 $71.76
7.	84 29 2436	67 46 3082	96 91 8736	35 35 1225	843 26 21,918	$3.04 83 $252.32	$5.21 78 $406.38
8.	59 23 1357	93 58 5394	80 75 6000	71 69 4899	583 46 26,818	$9.65 58 $559.70	$7.13 15 $106.95

9. Find the product of 34 and 69; of 19 and 93.
   2346 1767

10. Find the product when the multiplier is 35 and the multiplicand is 207. 7245

Review addition and subtraction skills. Provide practice in adding by endings and mental subtraction.

Review Practice

Add 8 to each number. (1) Add 9 to each one: (2)

(1) 35 94 102 81 87 73 105 67
(2) **1.** 27 36 86 95 94 103 73 82 79 88 65 74 97 106 59 68

61 33 26 90 56 42 69 54
2. 53 62 25 34 18 27 82 91 48 57 34 43 61 70 46 55

Subtract 6 from each number. (1) Subtract 10 from each: (2)

(1) 40 82 23 31 64 80 44 61
(2) **3.** 46 36 88 78 29 19 37 27 70 60 86 76 50 40 67 57

25 68 36 84 17 49 56 88
4. 31 21 74 64 42 32 90 80 23 13 55 45 62 52 94 84

Add these numbers. Check your work: Stress.

5. 5208	2470	6006	4135	6002
3493	1598	4639	1986	4999
8701	4068	10,645	6121	11,001

6. Subtract the numbers in ex. 5. 1715, 872, 1367, 2149, 1003

7. Susan's mother paid $18.75 for a coat for Susan. The coat had been marked down $4.95. Find the price of the coat before it was marked down. $23.70

8. Jim wants to buy a radio that costs $24.25. He has saved $19.95 so far. How much more does Jim need to save? $4.30

Begin at the bottom and add up. Check by adding down: Stress.

9. 32	20	60	92	62	79	42	53
29	64	56	97	69	79	52	99
67	98	70	69	90	82	97	35
58	51	14	10	71	15	68	90
70	15	68	16	12	37	46	43
256	248	268	284	304	292	305	320

Copy in columns, add, and check:

10. 5675 + 1790 + 2045 9510 3858 + 1429 + 6333 + 2647 14,267

11. 6842 + 4769 + 8268 19,879 2759 + 5113 + 1868 + 1925 11,665

12. 2254 + 1347 + 1106 4707 3144 + 4591 + 8021 + 4207 19,963

13. From 800 take 176; 624 subtract 298 from 1054. 756

14. From 236 take 168; 68 subtract 512 from 1000. 488

Let different pupils act as teacher in conducting oral work in ex. 1–4. Extend ex. 1–2 by having pupils add other numbers besides 8 and 9. Ex. 5–14 should be written. Group pupils who made errors for reteaching or drill.

Provide more practice in multiplying by 2-figure numbers.

The Cost of Food

1. Mrs. Chase spent $19.65 this week for food. Jim said, "I wonder what the cost of our food for a year would be if we spent $19.65 every week." Can you find the answer?

Stress. ▶ You multiply large numbers just as you did smaller numbers on page 47. Be careful to write the partial products in the right places. Put a decimal point before the last two figures in the product to separate the dollars from the cents. What is the answer to Jim's question? $1021.80

$19.65
52
39 30
982 5
$1021.80

Multiply. Check your work by going over it:

2.	4682 65 304,330	2461 98 241,178	7512 71 533,352	2048 18 36,864	$25.86 34 $879.24	$20.58 39 $802.62
3.	1430 54 77,220	3562 75 267,150	1793 82 147,026	4975 25 124,375	$13.75 67 $921.25	$19.25 49 $943.25
4.	7516 42 315,672	4170 19 79,230	2385 26 62,010	3369 51 171,819	$34.70 93 $3227.10	$89.65 83 $7440.95

5. Multiply by 47: 1048 49,256 2796 131,412 3840 180,480 5607 263,529

6. Multiply by 63: 1970 124,110 6412 403,956 3091 194,733 4258 268,254

7. Multiply by 29: 4316 125,164 7698 223,242 2849 82,621 1735 50,315

8. Multiply by 85: 3064 260,440 1275 108,375 8517 723,945 3294 279,990

More Practice. See ⑤ on page 312. Use to reinforce skill.

If some pupils still have difficulty with placement of partial products have them do some examples as two multiplications (5 × 4682, 60 × 4682), then add partial products. Stress place value of multipliers.

Multiplying by 10 and 100

Give the answers:

1. 10 × 5 50 10 × 9 90 10 × 15 150 10 × 23 230

To multiply a number by 10, you can write 0 after it.

2. You can multiply a number by 100 by writing 2 zeros after it. For example, 100 × 8 = 800, and 100 × 43 = 4300. Multiply these numbers by 100: 4, 7, 3, 5, 9, 17, 25.

700 500

400 300 900 1700 2500

To multiply a number by 100, you can write 00 after it.

3. You know that 30 is the same as 3 × 10. To multiply a number by 30, first multiply it by 3 and then multiply this product by 10. For example, to multiply 23 by 30, first multiply 23 by 3, which gives 69; then write 0 after 69, which gives 690. Multiply 12 by 40; 15 by 20; 11 by 60; 21 by 30; 16 by 20; 12 by 50.

480 300

660 630 320 600

4. In the same way, 400 is the same as 4 × 100. To multiply a number by 400, first multiply it by 4 and then multiply this product by 100. For example, to multiply 12 by 400, multiply 12 by 4, which gives 48; then write 00 after 48, which gives 4800. Multiply 11 by 700; 21 by 400. 8400

7700

5. When you multiply by numbers like 30 and 400, write the work as shown below, letting the zeros of the multiplier stand out at the right:

34	67	61	28	17
20	90	50	600	900
680	6030	3050	16800	15300

Multiply. Write the work as shown in ex. 5:

6. 80 × 26 2080 70 × 12 840 200 × 74 14,800 700 × 32 22,400

7. 30 × 19 570 50 × 46 2300 500 × 91 45,500 300 × 58 17,400

8. 40 × 15 600 20 × 97 1940 800 × 80 64,000 400 × 60 24,00

More Practice. See ⑥ on page 312.

Lead pupils to generalization in ex. 1-2 by putting various examples on board. Stress fact that product begins in tens or hundreds place since multiplier is tens or hundreds, and zeros are used to keep number in tens or hundreds place.

Problems with Hidden Questions

Reteach solving of two-step problems.

1. Problem Andy and Don are trying to collect 75 lb. of old newspapers. Last week they collected 23 lb. This week they have collected 28 lb. How many pounds must the boys still collect to get 75 lb. in all? 24

Explanation This is a 2-step problem. To work it you need to answer two questions. The first question is **hidden** and you must find it and answer it. A good hidden question for this problem is: How many pounds have the boys collected so far?

Step 1. Add 23 and 28 to answer the hidden question. This gives 51, as shown at the right. You now use 51 to work the second step.

Step 1

$$\begin{array}{r} 23 \\ 28 \\ \hline 51 \end{array}$$

Step 2. Now answer the question in the problem: How many pounds must the boys still collect to get 75 lb.? To find out, subtract 51 from 75, which gives 24. They need 24 lb. more to make 75 lb. in all.

Step 2

$$\begin{array}{r} 75 \\ 51 \\ \hline 24 \end{array}$$

First find the hidden question in ex. 2–16 and answer it. Then do the second step:

2. Sally spent 15¢ for a sandwich, 7¢ for milk, 5¢ for an apple, and 4¢ for a cookie. How much change did she get from a half dollar? How much did Sally's lunch cost? (31¢); 19¢

In discussing ex. 1 stress fact that pupils must look for and answer hidden question first (step 1) before they can answer problem question (step 2). Have pupils estimate answers first and label all answers.

3. Mrs. Wood bought 4 yd. of cloth at $1.69 a yard and some buttons for $.89. How much in all did she pay? How much did the cloth cost ($6.76); $7.65

4. The girls made 200 cookies for a bake sale. They sold 16 doz. cookies all together. How many cookies were left? How many cookies are 16 doz. cookies? (192); 8

5. Jack sold 3 doz. eggs at $.68 a dozen. He spent $.45 to go to the movies. How much egg money did Jack have left? How much did Jack collect for the eggs? ($2.04); $1.59

6. Mr. West sold 18 doz. oranges at 5¢ each. How much did he get for the oranges? How many oranges are 18 doz. oranges? (216); 1080¢, or $10.80

7. To buy things for a picnic lunch, 6 girls spent $.22, $.25, $.59, $.42, and $.26. They divided the cost equally. How much did each girl have to pay? What was the cost of the picnic? ($1.74); $.29

8. At the school play there were 15 rows of people. In each row there were 12 people. Each one paid $.35 to see the play. How much did they pay all together? How many people were at the play? (180); $63.00

9. Don and Jack shared equally $3.00 they earned. Don spent $.89 for a book. How much money did he have left? How much did each boy earn? ($1.50); $.61

10. Ann had $3.85. She earned $2.50 this week. If Ann puts $5.00 in the bank, how much will be left to spend? How much did Ann have after she earned $2.50? ($6.35); $1.35

11. John can get a package of 12 post cards for $.49 or pay 5¢ apiece for cards. If he wants to buy 12 cards, how much can John save by buying the package of cards? What is the cost of 12 post cards at 5¢ each? ($.60); $.11

12. Mr. Fellows paid $2.34 for 9 gal. of gasoline. How much will he pay for 15 gal. of gasoline at the same price? How much does 1 gal. of gasoline cost? ($.26); $3.90

13. At the store Betty spent these amounts: $.19, $.32, $.25, and $.07. How much change did she get from $1.00? How much did Betty spend? ($.83); $.17

14. Each week Bill earns $1.75 helping Mr. Green and $1.50 delivering newspapers. How much does he earn in 14 wk.? How much does Bill earn all together in 1 wk.? ($3.25); $45.50

15. Mrs. Hunt sold 10 doz. cookies at 4¢ apiece. How much money did she get from the sale of cookies? How many cookies are 10 doz. cookies? (120); 480¢, or $4.80

16. Bill and Jim bought a package of 150 stamps and shared them equally. Bill put his in a book with 212 stamps he already had. Then how many stamps had Bill in his book? How many stamps did Bill get from those he bought with Jim? (75); 287

Continue to do problems orally with class, letting different pupils give hidden question, another answer it, and so on. Have pupils make up own two-step problems for class to solve.

Reteach liquid measures (pint, quart, gallon) including abbreviations and equivalences.

Liquid Measure

1. For his car Mr. Swift buys gasoline by the gallon and oil by the quart. The **gallon** and the **quart** are two units used to measure liquids. Do you know another unit of liquid measure?

2. Learn this table of liquid measure:
Add to class chart (page 27).

2 cups (c.) = 1 pint (pt.)
2 pints (pt.) = 1 quart (qt.)
4 quarts (qt.) = 1 gallon (gal.)

3. How many cups are there in 1 pt.? 2 How many cups are there in 2 pt.? 4 Then how many cups are there in 1 qt.? 4

4. How many pints are there in 1 qt.? 2 How many pints are there in 4 qt., or 1 gal.? 8

5. At school milk comes in $\frac{1}{2}$-pint bottles. How many $\frac{1}{2}$-pint bottles can be filled by 1 qt. of milk? 4 How many $\frac{1}{2}$-pint bottles can be filled by 1 gal. of milk? 16

6. Name 2 liquids you can buy by the gallon. Name 2 you can buy by the quart.

7. The children need 8 qt. of ice cream for their party on Saturday. How much will it cost at $1.75 a gallon? $3.50

Tell what numbers to put in the spaces:

8. 8 qt. = 2 . . gal. 2 gal. = 8 . . qt. 6 pt. = 3 . . qt.
9. 8 pt. = 1 . . gal. 4 gal. = 32 . pt. 9 qt. = 18 . pt.
10. 4 pt. = 8 . . c. 3 gal. = 12 . qt. 6 qt. = 12 . pt.
11. 6 pt. = 12 . c. 1 gal. = 16 . c. 8 c. = 2 . . qt.
12. 2 qt. = 8 . c. $\frac{1}{4}$ gal. = 4 . . c. 4 c. = 2 . . pt.

Give pupils opportunity to estimate (then compare with accurate measures) amounts of cups, pints, and so on, in given quantity of liquid. Have various containers available for this work.

Present word problems involving mixed operations.

Selling Lemonade

1. One hot day before school opened in September, 3 children made lemonade to sell. They bought 6 doz. lemons at $.45 a dozen, a box of sugar for $.22, and paper cups for $1.00. Their mothers gave them the ice. How much money did they spend? $3.92

2. From 1 lemon they made enough lemonade to fill 3 paper cups. How many cups of lemonade did they make from 1 doz. lemons? 36 from 6 doz. lemons? 216

3. The children sold all the lemonade except 9 cups, which they drank. How many cups of lemonade did they sell? 207 At 6¢ a cup, how much did they get for the lemonade? 1242¢, or $12.42

4. From the money they made in ex. 3 the children had to pay for the things they bought in ex. 1. How much money did they have left? $8.50

5. The three children gave little Jack a quarter for helping them. They divided the rest of the money equally. How much money did each one get? $2.75

After doing problems, have pupils tell arithmetic knowledge needed for this activity. Try to develop awareness of use of arithmetic in everyday life. Urge pupils to make up own problems about similar experiences.

Review fundamental skills.

Keeping in Practice

Divide. Check the work:

1.	24 3)72	17 5)85	24 4)96	32 6)192	289 3)867	346 8)2768
2.	45 2)90	14 7)98	10R4 9)94	71R2 3)215	79 8)632	364 5)1820
3.	19 4)76	31R1 2)63	15R5 6)95	237R3 4)951	137 7)959	843 9)7587
4.	14 6)84	12R1 8)97	37R1 2)75	26 9)234	185 5)925	526R3 7)3685

Subtract. Check the work by adding:

5.	855 469 386	678 549 129	9294 2571 6723	4058 2974 1084	7068 2295 4773	4540 2358 2182
6.	600 313 287	588 536 52	5000 4857 143	6633 2634 3999	3000 2465 535	6786 1397 5389

7. Do ex. 5 and 6 again and add this time. Ex. 5: 1324, 1227, 11,865, 7032, 9363, 6898; ex. 6: 913, 1124, 9857, 9267, 5465, 8183

8. Find the cost of 21 ft. of ribbon at $.15 a yard. $1.05

9. How many quarts of milk will 45 gal. of milk make? 180

Multiply. Check the work by going over it:

10. 8 × 2476 19,808 7 × 8619 60,333 71 × 1098 77,958 96 × 1924 184,704

11. 3 × 1593 4779 5 × 8325 41,625 63 × 7462 470,106 18 × 3502 63,036

12. 6 × 3580 21,480 9 × 1785 16,065 29 × 3916 113,564 37 × 2480 91,760

Add up. Check the work by adding down:

13.	9047 7752 8492 9453 34,744	1727 3618 8646 6327 20,318	2579 2433 5645 8240 18,897	5934 5018 3546 1659 16,157	7738 2986 3859 1417 16,000	3878 1205 1964 4238 11,285
14.	9890 6677 5510 6136 28,213	7380 6212 5304 5453 24,349	2916 8385 6567 3652 21,520	9845 3048 1533 6574 21,000	2459 6508 1179 4220 14,366	4447 2629 2300 3534 12,910

Observe work habits of pupils and determine what type of problem is difficult for particular child. Try to give individual help where needed.

Review basic vocabulary (ex. 1–12) and present problems without numbers (ex. 13–19).

Do You Know These Words?

Show that you know what each word means by using it in a sentence or writing an example of it:

1. sum
2. divisor
3. addend
4. quotient
5. multiplier
6. minuend
7. product
8. difference
9. dividend
10. subtrahend
11. remainder
12. multiplicand

Do ex. 1–12 orally. Some pupils may need further review: have them use study cards made for page 29.

Problems without Numbers

Tell whether you add, subtract, multiply, or divide to get the answer:

13. You know the number of children in each of several schoolrooms. How do you find the number of children in all the schoolrooms? Add

14. You know the number of boys on a ball team. How do you find the number of boys on several teams of this kind? Multiply

15. You know how many sandwiches you made and how many are left. How do you find how many were eaten? Subtract

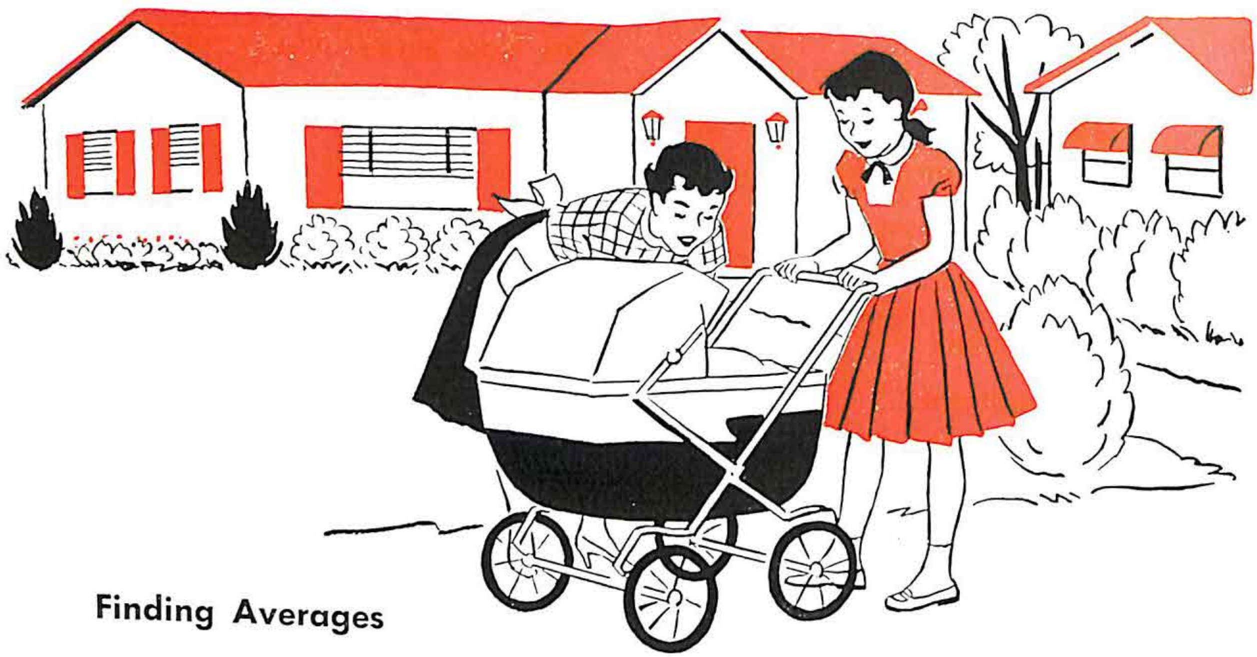
16. You know how many yards of cloth you need for a dress and the price of a yard of it. How do you find the cost of the cloth for the dress? Multiply

17. You know how many sheets of paper there are in a large package. You also know how many children will share the paper equally. How do you find the number of sheets of paper each child should receive? Divide

18. You know the cost of a radio you want to buy. You also know that the amount of money you have is not enough to buy it. How do you find how much more money you need? Subtract

19. You know how much you paid for a box of apples and how many apples there were all together. How do you find the cost of one apple? Divide

After pupils complete ex. 13–19 have different pupils suggest numbers which could be inserted in the problems to check understanding of problem situations.



Finding Averages

1. **Problem** After school Mary wheels Mrs. Hunt's baby or goes to the store for Mrs. Green. On 5 days last week she earned 50¢, 75¢, 65¢, 50¢, and 60¢. Find the average amount Mary earned per day. 60¢

Explanation To find the average, first add the 5 numbers, which gives 300. Then divide 300 by 5; this gives 60, which is called the **average** of the 5 numbers. Mary earned an average of 60¢ per day. **Per** day means by the day. **Per** hour means by the hour. Add to vocabulary list.

Emphasize.

$$\begin{array}{r} 50 \\ 75 \\ 65 \\ 50 \\ \underline{60} \\ 5\overline{)300} \\ 60 \end{array}$$

If Mary had earned 60¢ each day, she would have earned 300¢, or $3.00, in 5 days. The 50¢ she earned on two days was less than 60¢, but she made this up by earning 75¢ one day and 65¢ another day.

The average, 60, tells the number of cents Mary would have earned each day if she had been paid the same amount each of the 5 days. Stress.

2. Don also works after school. Last week on 4 days he earned $.75, $1.00, $.80, and $1.25. Find the average amount he earned per day. $.95

▶ Divide the sum by 4 because 4 numbers are added.

Discuss word average first. Ask pupils to think of times when they used it (average grades, attendance, speeds, temperature). Then follow text development. Permit slower pupils to use "a" for "per" if necessary.

3. Ann is selling tickets. On 3 days she sold 18 tickets, 13 tickets, and 14 tickets. Find the average number of tickets Ann sold per day. 15

4. Jack had sold 85 tickets at the end of 5 days. What was the average number of tickets he sold per day? 17

Emphasize. ▶ In this problem the sum 85 is given, so there are no numbers to be added. Divide 85 by 5 to find the average.

5. Mr. West drove 156 mi. in 4 hr. Find the average number of miles he drove per hour. 39

6. Patty bought her lunch at school every day last week. On Monday she spent 30¢; on Tuesday, 28¢; on Wednesday, 25¢; on Thursday, 33¢; on Friday, 29¢. What was the average cost per day of Patty's lunch? 29¢

7. In 4 weeks at camp last summer Bill spent these amounts for post cards and stamps: 50¢, 23¢, 7¢, 28¢. What was the average amount Bill spent per week for these things? 27¢

8. Susan says she had \$3.75 to spend while she was at camp for 3 weeks. Find the average amount Susan could spend per week. \$1.25

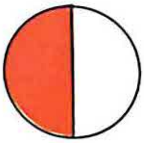
9. These are the amounts of money Andy put in the bank each month for the last 3 months: \$2.50, \$2.20, \$1.75. Find the average amount per month Andy put in the bank. \$2.15

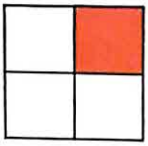
10. Sally has been putting money in the bank for the last 5 months. She now has \$12.85. What is the average amount per month Sally put in the bank? \$2.57

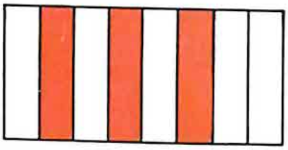
Have pupils make up original problems about averages from own experiences. Encourage use of word "per." Give pupils opportunity to find averages in class activities.

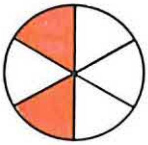
Reteach concept of halves, fourths, eighths, and the words fraction and one quarter.

The Meaning of Fractions









1. Into how many parts is the first circle divided? 2 What part of it is red? $\frac{1}{2}$ What part is white? $\frac{1}{2}$ You write one half like this: $\frac{1}{2}$. $\frac{1}{2}$ is a **fraction.**

2. Into how many parts is the square divided? 4 What part of it is red? $\frac{1}{4}$ What part is white? $\frac{3}{4}$

3. You write one fourth like this: $\frac{1}{4}$. One fourth is also called **one quarter.** You write three fourths like this: $\frac{3}{4}$. Three fourths is the same as three quarters. Are all four quarters of the square the same size? Yes

4. Into how many equal parts is the rectangle divided? 8 What part is red? $\frac{3}{8}$ Show how to write your answer. What part is white? $\frac{5}{8}$ Write your answer in figures.

5. Write a fraction that shows the red part of the last circle; $\frac{2}{6}$ a fraction that shows the white part. $\frac{4}{6}$

6. Draw a circle by drawing around the outside of a drinking glass. Divide the circle into fourths. Color three parts of it. What fraction tells the part that is colored? $\frac{3}{4}$ What fraction tells the part that is white? $\frac{1}{4}$ See G-28.

7. Draw a square 2 in. on a side. Divide it into 8 equal parts. What is the shape of each part? Color 4 parts of the square. What part of the square is colored? $\frac{1}{2}$ Write as many fractions as you can that show the colored part of the square. $\frac{4}{8}$, $\frac{2}{4}$, $\frac{1}{2}$

8. You see that there are 8 eighths in the square in ex. 7. You write it like this: $\frac{8}{8}$. One whole square equals 8 eighths. You write it like this: $1 = \frac{8}{8}$.

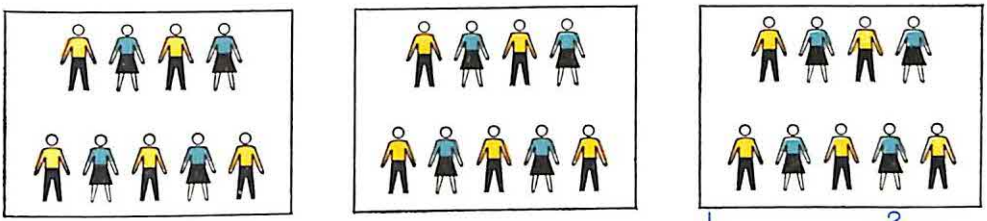
9. You see that the square above ex. 1 equals four fourths. You write it like this: $1 = \frac{4}{4}$.

Use flannelboard with fractional parts or large class ruler to demonstrate relative sizes of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$. Stress that bottom number tells number of equal parts in whole, top number tells number of parts we have.

Extend reteaching of fractions to include finding part of group of objects (using unit and multiple fractions).

Finding Fractional Parts

1. To help with party plans Miss Lake divided the 27 children in her room into 3 equal groups as shown below:



What part of all the children is 1 group? $\frac{1}{3}$ 2 groups? $\frac{2}{3}$ How many children are there in each group? 9 How many are $\frac{1}{3}$ of 27? 9 How many are $\frac{2}{3}$ of 27? 18 $\frac{3}{3}$ of 27? 27

2. There are 36 children in Miss Black's room. She asked $\frac{3}{4}$ of them to make paper chains for the Christmas tree. How many children was that? 27

You can find $\frac{3}{4}$ of 36 children like this:

$\frac{1}{4}$ of 36 children = 9 children
$\frac{3}{4}$ of 36 children = 3 × 9 children, or 27 children

3. How many eggs are there in $\frac{2}{3}$ doz.? 8 in $\frac{3}{4}$ doz.? 9

4. How many inches are there in $\frac{2}{3}$ ft.? 8 in $\frac{3}{4}$ ft.? 9

5. Find the cost of $\frac{2}{3}$ yd. of ribbon at 60¢ a yard. 40¢

6. Find the cost of $\frac{3}{4}$ yd. of ribbon at 88¢ a yard. 66¢

7. Find the cost of $\frac{3}{4}$ lb. of cheese at 80¢ a pound. 60¢

Give the answers:

8. $\frac{1}{5}$ of 20 4
$\frac{2}{5}$ of 20 8
$\frac{4}{5}$ of 20 16

9. $\frac{1}{8}$ of 48 6
$\frac{5}{8}$ of 48 30
$\frac{7}{8}$ of 48 42

10. $\frac{1}{7}$ of 35 5
$\frac{2}{7}$ of 35 10
$\frac{3}{7}$ of 35 15

11. $\frac{1}{6}$ of 42 7
$\frac{2}{6}$ of 42 14
$\frac{5}{6}$ of 42 35

12. $\frac{1}{9}$ of 18 2
$\frac{2}{9}$ of 18 4
$\frac{7}{9}$ of 18 14

13. $\frac{1}{5}$ of 50 10
$\frac{3}{5}$ of 50 30
$\frac{4}{5}$ of 50 40

14. $\frac{1}{8}$ of 72 9
$\frac{3}{8}$ of 72 27
$\frac{5}{8}$ of 72 45

15. $\frac{1}{7}$ of 63 9
$\frac{4}{7}$ of 63 36
$\frac{6}{7}$ of 63 54

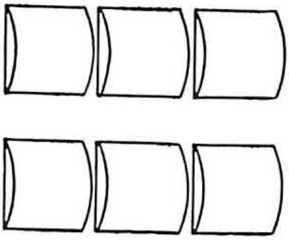
Follow development as given on this page. Have pupils talk out work and complete all examples orally. Let slower pupils make dot or line drawings to prove answers.

Teach new meaning of fraction: as an expression of division. Ex. 2 (4 ÷ 1) and ex. 7 illustrate why 1 is called the identity element of division.

Two Candy Bars for Three Girls

1. **Problem** Mrs. Bell had 2 candy bars. She gave them to Betty to share equally with Susan and Ann. How could Betty divide 2 candy bars equally among 3 girls?

Explanation Betty took a knife and cut one bar into thirds. Then she gave each girl $\frac{1}{3}$ of the bar. She did the same thing with the other bar and each girl got $\frac{1}{3}$ of that. How many thirds did each girl get? $\frac{2}{3}$ Write the answer as a fraction.



2. Ex. 1 shows that if 2 things are divided equally among 3 girls, each girl gets $\frac{2}{3}$ of **one** thing. This means that $2 \div 3 = \frac{2}{3}$. When you write $2 \div 3$ as $\frac{2}{3}$, the line between the 2 and the 3 means "divided by." You see that a fraction may be used to show division. For example, $\frac{5}{8} = 5 \div 8$; $\frac{3}{5} = 3 \div 5$; $\frac{5}{4} = 5 \div 4$; $\frac{6}{6} = 6 \div 6$; $\frac{4}{1} = 4 \div 1$, or 4.

In ex. 3–6 have pupils make drawings to prove answers.

Show what part of a candy bar each child will get:

3. If 1 candy bar is divided equally between 2 boys. $\frac{1}{2}$

4. If 2 candy bars are divided equally among 5 girls. $\frac{2}{5}$

5. If 3 candy bars are divided equally among 4 boys. $\frac{3}{4}$

6. If 4 candy bars are divided equally among 5 girls. $\frac{4}{5}$

7. You know that $5 \div 1 = 5$. So any whole number like 5 can be written in the form of a fraction like this: $\frac{5}{1}$. Stress.

Write each of these as a fraction:

8. $4 \div 5$ $\frac{4}{5}$ $2 \div 3$ $\frac{2}{3}$ $10 \div 3$ $\frac{10}{3}$ $16 \div 5$ $\frac{16}{5}$ 3 $\frac{3}{1}$

9. $5 \div 7$ $\frac{5}{7}$ $1 \div 4$ $\frac{1}{4}$ $15 \div 2$ $\frac{15}{2}$ $12 \div 5$ $\frac{12}{5}$ 8 $\frac{8}{1}$

10. $1 \div 5$ $\frac{1}{5}$ $6 \div 1$ $\frac{6}{1}$ $12 \div 7$ $\frac{12}{7}$ $13 \div 4$ $\frac{13}{4}$ 7 $\frac{7}{1}$

11. $4 \div 3$ $\frac{4}{3}$ $7 \div 4$ $\frac{7}{4}$ $11 \div 3$ $\frac{11}{3}$ $17 \div 2$ $\frac{17}{2}$ 5 $\frac{5}{1}$

Discuss ex. 1–2 carefully with pupils. Use other concrete illustrations in explaining $\frac{5}{8}$, $\frac{3}{5}$, and so on, in ex. 2. Lead pupils to see three meanings of fractions: $\frac{2}{3}$ may represent $\frac{2}{3}$ of single object, $\frac{2}{3}$ of group of object, or $2 \div 3$.

A Fraction in the Quotient

1. Problem In the sewing class Miss Field divided 10 yd. of cloth equally among 3 girls. How many yards did each one of the girls get? $3\frac{1}{3}$

Explanation When you divide 10 yd. by 3, you get 3 yd. with 1 yd. left over which you have not yet divided. If you divide this 1 yd. of cloth among the 3 girls, each girl gets $\frac{1}{3}$ yd. So each girl gets $3\frac{1}{3}$ yd. in all. You see that the $\frac{1}{3}$ at the end of $3\frac{1}{3}$ is found by dividing the remainder 1 by the divisor 3.

$$\begin{array}{r} 3\frac{1}{3} \\ 3\overline{)10} \\ \underline{9} \\ 1 \end{array}$$

When you have a remainder in division, you can write it over the divisor, making a fraction in the quotient. Stress.

2. Study these examples: Make up problems about things that can be expressed "sensibly" as fractions.

$$\begin{array}{r} 24\frac{3}{5} \\ 5\overline{)123} \\ \underline{10} \\ 23 \\ \underline{20} \\ 3 \end{array} \qquad \begin{array}{r} 23\frac{7}{8} \\ 8\overline{)191} \\ \underline{16} \\ 31 \\ \underline{24} \\ 7 \end{array} \qquad \begin{array}{r} 68\frac{3}{4} \\ 4\overline{)275} \\ \underline{24} \\ 35 \\ \underline{32} \\ 3 \end{array} \qquad \begin{array}{r} 72\frac{5}{6} \\ 6\overline{)437} \\ \underline{42} \\ 17 \\ \underline{12} \\ 5 \end{array}$$

Divide. Use the remainder to give a fraction in the quotient:

3. $5\overline{)31}$ $6\frac{1}{5}$ $2\overline{)93}$ $46\frac{1}{2}$ $6\overline{)443}$ $73\frac{5}{6}$ $8\overline{)429}$ $53\frac{5}{8}$ $9\overline{)577}$ $64\frac{1}{9}$ $4\overline{)279}$ $69\frac{3}{4}$

4. $6\overline{)49}$ $8\frac{1}{6}$ $7\overline{)55}$ $7\frac{6}{7}$ $9\overline{)230}$ $25\frac{5}{9}$ $3\overline{)860}$ $286\frac{2}{3}$ $5\overline{)489}$ $97\frac{4}{5}$ $7\overline{)410}$ $58\frac{4}{7}$

5. $9\overline{)85}$ $9\frac{4}{9}$ $5\overline{)92}$ $18\frac{2}{5}$ $2\overline{)175}$ $87\frac{1}{2}$ $4\overline{)941}$ $235\frac{1}{4}$ $7\overline{)849}$ $121\frac{2}{7}$ $3\overline{)293}$ $97\frac{2}{3}$

6. $2\overline{)59}$ $29\frac{1}{2}$ $8\overline{)75}$ $9\frac{3}{8}$ $4\overline{)299}$ $74\frac{3}{4}$ $6\overline{)295}$ $49\frac{1}{6}$ $3\overline{)163}$ $54\frac{1}{3}$ $8\overline{)383}$ $47\frac{7}{8}$

7. Mrs. March bought 5 yd. of cloth for 2 curtains. How many yards did she plan to use for each curtain? $2\frac{1}{2}$

8. Mrs. Gates bought 9 yd. of cloth for 8 towels. How many yards did she plan to use for each towel? $1\frac{1}{8}$

9. How many yards are $\frac{1}{8}$ of 31 yd.? $3\frac{7}{8}$ $\frac{1}{8}$ of 63 yd.? $7\frac{7}{8}$

In ex. 1 be sure pupils understand why remainder can be expressed as fraction (since it is possible to have $\frac{1}{3}$ yd. of cloth). Have pupils make up some problems for ex. 3-6; be sure items can be expressed as fractions.

Show "when" to express remainder in division as fraction.

Using Common Sense

1. On a vacation trip 3 sisters bought a package of 25 post cards. They wanted to divide the cards equally. Ann said, "I have divided 25 by 3 and each one of us should have $8\frac{1}{3}$ cards." Is Ann right? No

2. Betty said, "One third of a card is no good. We will each have 8 cards and there will be 1 card left. We can give it to Bill." Betty says the answer is 8 R1 and not $8\frac{1}{3}$. Is Betty right? Yes

$$\begin{array}{r} 8\frac{1}{3} \\ 3\overline{)25} \\ \underline{24} \\ 1 \end{array} \qquad \begin{array}{r} 8\text{ R1} \\ 3\overline{)25} \\ \underline{24} \\ 1 \end{array}$$

3. In division problems you must use common sense when you write the answers. Always decide carefully whether the remainder should be left as a remainder or used to give a fraction in the quotient.

In each problem suppose that the things are to be shared equally. Tell which way you should use the remainder:

4. If 2 boys share 35 marbles; 17 marbles, 1 over if 4 boys share 5 oranges. $1\frac{1}{4}$ oranges
5. If 4 girls share 7 yd. of ribbon; $1\frac{3}{4}$ yd. if 3 boys share 25¢. 8¢, 1¢ over
6. If 8 children share 25 Christmas bells. 3 bells, 1 over
7. Jim sold 75 carrots in bunches with 8 carrots in each bunch. How many bunches of carrots did he sell? 9 bunches, 3 carrots over
8. Mother made 8 aprons all alike. She used 11 yd. of cloth. How many yards of cloth did she use for 1 apron? $1\frac{3}{8}$ yd.

Discuss ex. 1-3 carefully with pupils. Be sure they understand explanation in ex. 2. Do ex. 4-8 with pupils and have them tell why remainder can or cannot be written as fraction.

Review fundamental skills in addition, subtraction, and multiplication.

Review Practice

Copy in columns, add, and check:

1. 52, 60, 37, 88, 79, 43 359 558, 872, 691, 103, 176 2400
2. 24, 55, 87, 69, 52, 13 300 273, 445, 866, 134, 377 2095
3. 73, 36, 52, 27, 64, 28 280 912, 538, 693, 155, 349 2647
4. 41, 73, 69, 98, 24, 42 347 239, 482, 698, 973, 114 2506
5. 43, 68, 14, 56, 83, 75 339 287, 640, 356, 991, 408 2682
6. 64, 55, 76, 97, 48, 21 361 518, 397, 874, 985, 408 3182
7. 26, 78, 47, 94, 35, 68 348 540, 438, 992, 767, 259 2996
8. Find the sum of $12.38, $25.16, $15.95, $31.60. $85.09
9. What is the difference between $20.00 and $14.98? $5.02

Subtract and check the work:

10.	7217 3693 3524	5361 3673 1688	9252 6458 2794	7202 5879 1323	6008 2579 3429
11.	9866 1787 8079	6045 4279 1766	8838 3555 5283	7000 2695 4305	1544 998 546
12.	5280 2582 2698	3907 3239 668	7402 6885 517	6130 5873 257	1000 644 356

13. Find the product of 30 and 92; 2760 of 65 and 147. 9555

Multiply and check the work:

14.	93 68 6324	50 65 3250	612 19 11,628	723 55 39,765	1267 26 32,942	8702 97 844,094
15.	58 31 1798	94 76 7144	257 48 12,336	163 87 14,181	2791 43 120,013	5349 92 492,108
16.	64 93 5952	78 29 2262	863 36 31,068	436 84 36,624	4618 58 267,844	3058 72 220,176

Try to determine if processes or facts cause difficulty. Reteach, emphasizing meanings, before beginning new work.

Explanation in ex. 1 is based on distributive principle for multiplication. i.e., 198 × 245 = (8 + 90 + 100)(245) = 8 (245) + 90 (245) + 100 (245).

Three-Place Multipliers

1. Problem Each day that he works Mr. Lane drives a bus 245 mi. He usually works 198 da. a year. How many miles does Mr. Lane drive the bus in a year? 48,510

Explanation Multiply 245 by 198 just as you multiply by a 2-place number like 98. Notice that in the first partial product the right-hand figure of 1960 comes under the 8 of 198. In the second partial product the 5 of 2205 comes under the 9 of 198. This product is really 22,050 or 2205 tens because you have multiplied 245 by 90. In the third partial product the 5 of 245 comes under the 1 of 198. This product is really 24,500 or 245 hundreds because you have multiplied 245 by 100.

245
198
1960
2205
245
48510

Add the partial products. The answer is 48,510, so Mr. Lane drives his bus 48,510 mi. in a year.

You can check the work by going over it. You can also check by changing the places of 245 and 198, writing 245 under 198, as shown here. Then multiply again; the product is 48,510. This product is the same as the one you got first, so call the work right. Ask pupils what principle (commutative) is applied here.

Check

198
245
990
792
396
48510

2. Study these four examples. Check the work by changing the places of the two numbers and multiplying again:

473
348
3784
1892
1419
164604

296
182
592
2368
296
53872

814
417
5698
814
3256
339438

657
591
657
5913
3285
388287

Be sure pupils know "why."

Place the right-hand figure of each partial product under the figure by which you are multiplying.

Stress reasons for placement of partial products, that is, product begins in ones, tens, or hundreds place because multiplier is ones, tens, or hundreds.

Provide practice in multiplication of 3-place numbers by 3-place numbers and in using new check.

Problems and Practice

1. At a sale a store sold 379 yd. of cloth at $1.25 a yard. How much did they get for the cloth? $473.75
2. Mr. Brown sold 235 television sets at $195 each. How much did he get from the sale of these sets? $45,825
3. Last year Swift's Store sold 175 sweaters at $3.98 apiece. How much money did these sweaters bring? $696.50
4. There are 360 eggs in a case of eggs. A farmer sold 436 cases of eggs last year. How many eggs did he sell all together? 156,960
5. Last week 184 children in the Park School went by bus to Mountain Lake. It cost $1.15 for each child. How much did it cost for all the children? $211.60

Multiply. Check as shown on page 66: Stress checking.

6.	467 153 71,451	596 418 249,128	199 179 35,621	582 169 98,358	583 524 305,492	178 158 28,124
7.	278 247 68,666	395 257 101,515	627 186 116,622	646 459 296,514	914 193 176,402	485 345 167,325
8.	297 195 57,915	456 278 126,768	468 468 219,024	813 537 436,581	368 159 58,512	732 259 189,588
9.	432 368 158,976	436 175 76,300	196 243 47,628	681 491 334,371	633 524 331,692	754 687 517,998
10.	827 439 363,053	953 917 873,901	984 652 641,568	183 183 33,489	281 257 72,217	579 486 281,394

11. Find the product of 486 and 739 and check. 359,154
12. Multiply 762 by 273 and check your work. 208,026
13. Find the product of 386 and 521, using 386 as multiplier. 201,106

More Practice. See ⑦ on page 312. Use for reteaching.

Have pupils explain some examples and give reasons for placement of partial products. Group pupils for reteaching (stress meanings) or drill on facts.

Present word problems containing extra facts.

Which Numbers Are Not Needed?

In certain problems on this page some numbers are given that are not needed in finding the answer. Tell which numbers are not needed and then work the problems:

1. Bill has 24 hens. Yesterday he got 19 eggs and today he got 17 eggs. He sold 30 eggs in the 2 days. How many eggs are left? 6

▶ In working this problem you do not use 24 and 2. The only numbers used to get the answer are 19, 17, and 30.

2. Jack wants a new radio that costs \$19.00. He has worked 2 Saturday mornings and after school on 5 days. Jack has earned \$9.75 all together. How much more must he earn to buy the radio? "2 Saturday mornings" and "5 days" not needed; \$9.25

3. Susan bought $\frac{1}{2}$ lb. of cheese at \$.90 a pound and a package of crackers for \$.29. How much did she spend? \$.74

4. At one store Ann bought meat for \$1.25 and eggs for \$.65. She paid \$1.90 there. At the second store Ann bought 5 lb. of potatoes for \$.29. How much money did Ann spend in both stores? "\$1.25" and "\$.65" not needed; \$2.19

5. Mrs. Chase bought 4 yd. of silk for \$7.92, 2 yd. of cotton cloth for \$1.98, and 8 buttons for \$1.25. How much did all these things cost? "4 yd.," "2 yd.," and "8 buttons" not needed; \$11.15

6. At a sale Jim bought a coat for \$17.75 that had been marked down \$6.50. He paid for the coat with \$20.00. How much money did he have left? "\$6.50" not needed; \$2.25

7. A one-way bus ticket to camp costs \$.85. A round-trip ticket to camp costs \$1.62. How much did Don pay for 3 round-trip tickets for Ben, Jack, and himself? "\$.85" not needed; \$4.86

8. Susan spent \$.75 for candy and \$.50 for nuts. How much money did she spend? \$1.25

9. Dick earned \$1.50 on Monday, \$1.25 on Wednesday, and \$2.20 on Friday. Find the average amount that he earned per day. \$1.65

Purpose of this work is to give pupils practice in judging which facts are real, pertinent, and necessary, and which facts are unreal and unnecessary. Do ex. 1-9 with pupils, having them tell why facts are unnecessary.

Zeros in Multiplication

1. Problem Circus tickets cost $2.75. Today 907 tickets were sold. How much money was taken in from the sale of tickets today? $2494.25

Explanation You can multiply as in A. First multiply 275 by 7, which gives 1925. Next multiply by 0 and write three 0's under 1925. Then multiply by 9. It saves time to do the work as in B, where the row of zeros is left out. Be sure to write the 5 of 2475 under the 9 of the multiplier. How do you finish the work?

A

$$\begin{array}{r} \$2.75 \\ 9\,07 \\ \hline 19\,25 \\ 00\,0 \\ 2475 \\ \hline \$2494.25 \end{array}$$

B

$$\begin{array}{r} \$2.75 \\ 9\,07 \\ \hline 19\,25 \\ 2475 \\ \hline \$2494.25 \end{array}$$

2. Problem Multiply 374 by 250.

Explanation To multiply 374 by 250, you can multiply by 25 and write a zero after that product. To do this, write 250 under 374, as in C, letting the 0 stand out at the right. When you begin the work, first write the 0 of 250 below the line and then multiply by 5 and 2. Be sure to write the 8 of 748 under the 2 by which you multiplied. How do you check the work?

C

$$\begin{array}{r} 374 \\ 250 \\ \hline 18700 \\ 748 \\ \hline 93500 \end{array}$$

Stress place-holding nature of zero in discussing ex. 1-2.

Multiply. Check your work by changing the places of the multiplicand and the multiplier: Do not insist that pupils use offset method.

3.	917 508 465,836	347 204 70,788	568 301 170,968	342 350 119,700	621 470 291,870	568 280 159,040
4.	214 103 22,042	423 806 340,938	960 604 579,840	791 630 498,330	397 170 67,490	291 270 78,570
5.	856 605 517,880	508 307 155,956	794 109 86,546	875 490 428,750	904 740 668,960	463 290 134,270

More Practice. See ⑧ on page 313.

Discuss and compare the two ways of multiplying in ex. 1. Ask pupils why the 5 of 2475 is written under the 9 of multiplier, in B. Urge them to avoid use of extra zeros (A). In ex. 2, first review multiplication by tens and generalization (page 51).

Oral Review

Add 7 to each number.(1) Add 9;(2) add 10;(3) add 20:(4)

(1), (2) 37,39 71,73 36,38 49,51 85,87 24,26 60,62 93,95
(3), (4) **1.** 30 40,50 64 74,84 29 39,49 42 52,62 78 88,98 17 27,37 53 63,73 86 96,106

28,30 54,56 25,27 42,44 91,93 46,48 83,85 69,71
2. 21 31,41 47 57,67 18 28,38 35 45,55 84 94,104 39 49,59 76 86,96 62 72,82

3. Subtract 9 from each number in ex. 1 and 2. Ex 1:21,55,20,33,69, 8,44,77; ex.2:12,38,9,26,75,30,67,53

4. Multiply each number by 10: 37, 82, 16, 49, 60, 25. 250
370 820 160 490 600

5. Multiply each number by 100: 28, 14, 30, 36, 43, 57. 5700
2800 1400 3000 3600 4300

6. Find $\frac{1}{3}$ of each number: 9, 3 15, 5 21, 7 27, 9 30, 10 36. 12

7. Find $\frac{3}{4}$ of each number: 8, 6 16, 12 24, 18 36, 27 28, 21 40. 30

8. How many quarts are there in 1 gal.? 4 in 6 gal.? 24

9. How many gallons are there in 16 qt.? 4 in 32 qt.? 8

10. How many yards are there in 15 ft.? 5 in 27 ft.? 9

11. How many ounces are there in $\frac{3}{4}$ lb.? 12 in $\frac{7}{8}$ lb.? 14

12. What is the name of the 5 in 30 ÷ 5 = 6? Divisor

13. What is the whole number that equals $\frac{4}{4}$? 1

14. Multiply each number by 8 and add 7 to the product:

4 39 9 79 2 23 8 71 5 47 7 63 6 55 0 7 3 31

15. How many 3-cent candies can you buy with a quarter? 8, 1¢ over

16. Suppose 2 girls share 3 apples equally. How many apples will each girl get? $1\frac{1}{2}$

17. Suppose 2 boys share 5 marbles equally. How many marbles will each boy get? 2, 1 marble over

18. On 3 days Ann saved 6¢, 2¢, and 7¢. What was the average number of cents she saved per day? 5¢

19. In 2 weeks Bill saved $6. What is the average number of dollars Bill saved per week? $3

20. At the store Tom spent 5¢ for a pencil and 8¢ for paper. He gave the man a quarter. How much change did he get? 12¢

Conduct review as quiz program, dividing class into teams and letting different pupils act as quiz master. Note class or individual difficulties with skills, concepts, or vocabulary. Review further.

Introduce timed tests on the four fundamental operations. See page 328 for discussion.

Testing Your Skill

You should be able to do all the exercises in each test correctly in the time allowed.

Addition Test

Add. Write the answers on folded paper: Time: 5 min.

1.	439	613	756	887	262	342
	556	124	254	865	659	330
	342	270	328	737	456	901
	278	502	496	144	894	889
	414	139	603	275	343	538
	2029	1648	2437	2908	2614	3000

Subtraction Test

Subtract. Write the answers on folded paper: Time: 3 min.

2.	466	568	436	929	700	682
	347	489	278	759	465	483
	119	79	158	170	235	199
3.	699	813	555	300	844	691
	682	514	199	257	648	593
	17	299	356	43	196	98

Multiplication Test

Copy and multiply: Time: 4 min. after copying.*

4.	214	639	527	386	471	859
	58	17	93	29	46	65
	12,412	10,863	49,011	11,194	21,666	55,835

Division Test

Copy and divide: Time: 4 min. after copying.*

5.	876 2)1752	465 5)2325	235R3 8)1883	568 4)2272
6.	346R1 9)3115	834 7)5838	476 3)1428	839 6)5034

---

* In the multiplication and division tests, copy all the exercises on a sheet of paper before taking the test. In copying, spread the exercises over the sheet to allow space for the work. See page 328.

A class of average ability should be able to do these tests in time assigned. Modify times indicated according to own class. Give one test a week, not all four at one time. Note results on progress cards and plan remedial activities.

See G-32 for correlation of examples with aims.

Chapter Review

1. On 4 days Jim got these numbers of eggs from his hens: 25, 31, 24, 28. What was the average number of eggs Jim got per day? 27

2. Ann went to the store for $\frac{3}{4}$ lb. of cheese. The packages were marked in ounces. Ann bought a package marked 10 oz. Did she have more or less than $\frac{3}{4}$ lb.? Less How much more or less did she have? 2 oz. less

3. Three boys divided 40 marbles equally. How many marbles did each boy get? 13, 1 marble over

4. Three girls divided 20 yd. of ribbon equally. How many yards did each girl have? $6\frac{2}{3}$

5. In the last 6 weeks Tom has earned $22.80. How much, on the average, has Tom earned per week? $3.80

6. Sally bought 2 doz. rolls at $.39 a dozen. How much change did she get from $1.00? $.22

Find the answers:

7. $\frac{1}{4}$ of 28 7 $\frac{3}{4}$ of 28 21 $\frac{1}{8}$ of 56 7 $\frac{3}{8}$ of 56 21 $\frac{5}{8}$ of 56 35

8. $\frac{1}{3}$ of 24 8 $\frac{2}{3}$ of 24 16 $\frac{1}{5}$ of 40 8 $\frac{3}{5}$ of 40 24 $\frac{4}{5}$ of 40 32

9. $\frac{1}{6}$ of 54 9 $\frac{5}{6}$ of 54 45 $\frac{1}{7}$ of 42 6 $\frac{3}{7}$ of 42 18 $\frac{4}{7}$ of 42 24

10. $\frac{1}{4}$ of 84 21 $\frac{3}{4}$ of 84 63 $\frac{1}{5}$ of 60 12 $\frac{2}{5}$ of 60 24 $\frac{3}{5}$ of 60 36

Multiply and check the work:

11.	$5.10 29 $147.90	$19.36 57 $1103.52	623 298 185,654	250 136 34,000	745 407 303,215	59 300 17,700
12.	$3.25 64 $208.00	$25.16 36 $905.76	874 285 249,090	607 459 278,613	852 573 488,196	93 600 55,800
13.	$1.90 48 $91.20	$14.78 63 $931.14	479 192 91,968	901 287 258,587	430 305 131,150	68 400 27,200

Use review as preparation for diagnostic test and as test of readiness for new work. Have pupils talk out solutions to see if processes, concepts, and so on, cause difficulty.

A Problem Test

1. A cake of soap costs \$.09. A box of 1 doz. cakes of this soap costs \$.98. How much can Mrs. Smith save on soap if she buys a box instead of buying one cake at a time? \$.10

2. In Jim's class this week the children were not all in school every day. The numbers there each day were as follows: 30, 26, 31, 31, 32. Find the average number of children per day in school. 30

3. Mother bought a 5-pound bag of sugar for 49¢. What was the price of the sugar per pound? $9\frac{4}{5}$¢

4. Find the cost of $\frac{3}{4}$ lb. of candy at \$.80 a pound. \$.60

5. Mr. Wells bought 9 gal. of gasoline and paid \$2.43 for it. Find the cost of 1 gal. of gasoline. \$.27

6. Mrs. Chase made 112 cookies to sell. On Saturday she had only 16 cookies left. How many cookies did she sell? 96

7. Three boys bought a package of 500 stamps and divided them equally. How many stamps did each boy get? 166 Were any stamps left over? 2

8. John's father can drive his car 19 mi. on a gallon of gasoline. If he has 16 gal. of gasoline in the tank, about how many miles can he drive? Estimate: 320 mi.; exact: 304 mi.

9. Jane has saved \$29.20 in the last 8 months. How much, on the average, has she saved per month? \$3.65

10. Dick spent \$.75, \$.15, \$.25, and \$.69 when he went on a trip to Mountain Lake. When he left home he had \$3.00. How much did he have left after the trip? \$1.16

How many problems did you get right? Look below to find out what your score means.

SCORE	0–5 You need help	6–7 Fair	8–9 Good	10 Excellent

Allow pupils ample time to complete work. Have them record scores on charts (page 43) and compare with previous one. Help pupils who did poorly to analyze their errors. Let others work at arithmetic corner.

Present diagnostic test in arithmetic skills.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Pages for that row.

Find the answers:

					Practice Pages
1.	$\frac{1}{5}$ of 30 6	$\frac{2}{5}$ of 30 12	$\frac{3}{5}$ of 30 18	$\frac{4}{5}$ of 30 24	61
2.	$\frac{1}{8}$ of 72 9	$\frac{3}{8}$ of 72 27	$\frac{5}{8}$ of 72 45	$\frac{7}{8}$ of 72 63	61
3.	$\frac{1}{6}$ of 36 6	$\frac{5}{6}$ of 36 30	$\frac{1}{3}$ of 18 6	$\frac{2}{3}$ of 18 12	61

Divide and check. Use the remainder to give a fraction in the quotient:

4.	$68\frac{1}{5}$ $5\overline{)341}$	$59\frac{2}{7}$ $7\overline{)415}$	$87\frac{3}{4}$ $4\overline{)351}$	$128\frac{1}{2}$ $2\overline{)257}$	63
5.	$35\frac{5}{8}$ $8\overline{)285}$	$74\frac{4}{9}$ $9\overline{)670}$	$93\frac{5}{6}$ $6\overline{)563}$	$65\frac{2}{3}$ $3\overline{)197}$	63

Multiply and check:

6.	57 26 1482	65 83 5395	398 74 29,452	238 19 4522	47, 48
7.	2173 65 141,245	6401 92 588,892	2317 37 85,729	3829 48 183,792	50
8.	378 50 18,900	546 70 38,220	94 600 56,400	89 300 26,700	51
9.	298 172 51,256	417 385 160,545	541 496 268,336	608 367 223,136	66, 67
10.	945 703 664,335	509 509 259,081	893 602 537,586	276 480 132,480	69

Find the average of

11. 16, 10, 15, 19 15   73, 82, 67, 80, 83 77   58

Note errors and hesitancy on progress cards and compare with previous ones to see if improvements have been made. Urge pupils to make own self-assignments from practice pages.

See G-34 for specific aims of Chapter 3.

Chapter 3

Post Riders

Present mixed problems about mail delivery in early days.

In the early days of this country, men on horseback carried letters, newspapers, and small packages from city to city. These men were called post riders. Later on mail was carried by stagecoach and then by the railroads. Today fast delivery is made by airplanes.

1. Post riders began in January, 1673, to carry letters once a month between New York and Boston, a distance of 234 mi. Two riders started on Monday morning, one from Boston, the other from New York. They met halfway between the two cities on Saturday evening. How far had each man ridden? 117 mi. How many days had each man been traveling? 6

2. The next Monday morning the riders exchanged letters and returned to their home cities. Each one arrived home the next Saturday night. How many days did it take letters to go from Boston to New York in 1673? 13 What is the whole distance each man traveled? 234 mi.

3. Today some airplanes fly between New York and Boston in 1 hr. 5 min. How many minutes does the trip take? 65

Have pupils find out flying time of fastest New York-Boston plane and use in ex. 3 also. These examples (pages 75-76) may be correlated with social studies lessons also.

The Pony Express

1. Before railroads were built in the West, post riders of the Pony Express carried the mail. The Pony Express started in 1860. The post riders between New York and Boston started in 1673. How many years after 1673 did the Pony Express start? 187

2. The Pony Express covered a distance of 1950 mi. The trip from New York to Boston was 234 mi. Was the Pony Express trip about 7 times, 8 times, or 9 times as far as the trip from New York to Boston? About 8 times

3. The horses of the Pony Express ran at full speed. Every 10 mi. a Pony Express rider changed to a fresh horse. A rider had 5 different horses on his day's run. How many miles did each rider go? 50

4. It took a letter 13 da. to go 234 mi. from New York to Boston. Was this about 15 mi., 18 mi., or 20 mi. a day? 18

5. The Pony Express mail was carried about 195 mi. a day by several riders. Did it take 9 da. or 10 da. for the mail to go the whole distance of 1950 mi.? 10

6. To send a letter by Pony Express cost \$5.00 for each $\frac{1}{2}$ oz. or less that the letter weighed. What did it cost to send a letter weighing 1 oz.? \$10.00 a letter weighing 2 oz.? \$20.00

Prepare for division by even tens (pages 78-80).

1. Jean has some pretty fish in a tank. She has 75¢ to spend for more fish. At 30¢ each, how many fish can Jean buy? 2 How much money will she have left? 15¢ Jean answered these questions as shown below.

2. Jean thought, "If I buy 1 fish for 30¢, I will have 45¢ left. I can buy one more fish for 30¢ and have 15¢ left. I cannot buy another fish because 15¢ is less than 30¢." Jean subtracted 30¢ from 75¢ and then subtracted 30¢ from the remainder 45¢. Since only 15¢ would be left, she could not buy any more fish. Jean could buy 2 fish in all.

3. Suppose Jean had $1.50 and wanted to buy fish that cost $.40 each. How many fish could she buy? 3 Would she have any money left? Yes If so, how much would be left? $.30 Do the work in the way it was done in ex. 2.

4. In ex. 2 and 3, you used subtraction to find how many fish Jean could buy. It is shorter to work these problems by division. On the next page you will learn how to divide by numbers like 30 and 40.

Urge pupils to make up additional problems from own experiences. Ex. 1-3 serve as introduction to work on following pages and point up subtractive aspect of division.

See G-35, 36 for discussion of long division and distribution of work on it in text. Also see G-4, 5 for more detailed discussion.

Two-Place Divisors

1. **Problem** How many fish at 30¢ each can Jean buy for 75¢? 2

Explanation This is the way to divide 75 by 30.

$$\begin{array}{r} 2 \\ 30\overline{)75} \\ \underline{60} \\ 15 \end{array}$$

(1) **Divide.** There are about as many 30's in 75 as there are 3's in 7. To divide 75 by 30, look at the 3 of 30 and the 7 of 75. Think, "There are two 3's in 7." Write 2 in the quotient over the 5 of 75. Stress reason, that is, we are dividing 75 ones.

(2) **Multiply** 30 by 2, which gives 60. Write 60.

(3) **Subtract** 60 from 75, which leaves 15.

(4) **Compare** the remainder, 15, with the divisor, 30. The remainder must always be less than the divisor. You see that 15 is less than 30, which is as it should be. Stress.

(5) The work above shows that there are two 30's in 75 with 15 left over. In this problem the work was done by division. In ex. 2 on page 77, Jean did the same problem by subtraction.

Check

$$\begin{array}{r} 30 \\ \underline{2} \\ 60 \\ \underline{15} \\ 75 \end{array}$$

(6) **Check.** Multiply the divisor, 30, by the quotient, 2, which gives 60. Add the remainder, 15, which gives 75. Since 75 equals the dividend, the work is right.

In the work above, 30 is the **divisor,** 75 is the **dividend,** 2 is the **quotient,** and 15 is the **remainder.** The division above is called **long division.** Division with a one-place divisor is called **short division** if the work is done mentally and only the quotient is written. Add new terms, long division and short division, to arithmetic vocabulary chart (page 8).

Divide. Check your work by multiplying:

2. $\overset{3\text{ R}7}{20\overline{)67}}$ $\overset{2\text{ R}13}{40\overline{)93}}$ $\overset{3\text{ R}7}{30\overline{)97}}$ $\overset{4}{20\overline{)80}}$ $\overset{2\text{ R}7}{40\overline{)87}}$

3. $\overset{3\text{ R}3}{30\overline{)93}}$ $\overset{2\text{ R}17}{20\overline{)57}}$ $\overset{1\text{ R}32}{40\overline{)72}}$ $\overset{3\text{ R}8}{20\overline{)68}}$ $\overset{1\text{ R}14}{30\overline{)44}}$

4. $\overset{2\text{ R}9}{40\overline{)89}}$ $\overset{2\text{ R}10}{30\overline{)70}}$ $\overset{2\text{ R}6}{20\overline{)46}}$ $\overset{2\text{ R}12}{30\overline{)72}}$ $\overset{2\text{ R}6}{40\overline{)86}}$

5. $\overset{2\text{ R}5}{30\overline{)65}}$ $\overset{1\text{ R}21}{40\overline{)61}}$ $\overset{2\text{ R}27}{30\overline{)87}}$ $\overset{2\text{ R}5}{40\overline{)85}}$ $\overset{4\text{ R}5}{20\overline{)85}}$

Reinforce understanding that division by even tens is actually 1-figure division extended to tens place. Emphasize this in ex. 2-5 by having pupils do them orally first, as 6 tens divided by 2 tens = 3, and so on.

As on page 78, have pupils do some examples orally first, as 8 tens divided by 4 tens = 2, and so on.

More Practice

1. The 80 children in the fourth grade of Maple School are going to Rock Park in busses. Each bus can carry 40 children. How many bus loads do 80 children make? 2

2. The 30 children in Miss Black's room want to sell 90 tickets for the school circus. How many tickets should each one sell so that no tickets are left? 3

3. A small box of cookies costs 20¢. How many boxes of these cookies can Ann buy for 60¢? 3

Divide. Check your work by multiplying:

4.	$40\overline{)84}$ 2R4	$20\overline{)43}$ 2R3	$30\overline{)61}$ 2R1	$50\overline{)96}$ 1R46	$20\overline{)76}$ 3R16
5.	$20\overline{)55}$ 2R15	$30\overline{)98}$ 3R8	$40\overline{)83}$ 2R3	$60\overline{)75}$ 1R15	$30\overline{)62}$ 2R2
6.	$30\overline{)55}$ 1R25	$20\overline{)53}$ 2R13	$40\overline{)70}$ 1R30	$50\overline{)82}$ 1R32	$30\overline{)54}$ 1R24
7.	$60\overline{)94}$ 1R34	$20\overline{)91}$ 4R11	$50\overline{)90}$ 1R40	$30\overline{)67}$ 2R7	$40\overline{)82}$ 2R2
8.	$50\overline{)89}$ 1R39	$40\overline{)90}$ 2R10	$20\overline{)45}$ 2R5	$40\overline{)67}$ 1R27	$60\overline{)90}$ 1R30

9. Divide by 40: 80 2 59 1R19 64 1R24 81 2R1 91 2R11 53 1R13 71 1R31

10. Divide by 50: 95 1R45 84 1R34 79 1R29 68 1R18 97 1R47 74 1R24 63 1R13

11. Divide by 30: 90 3 66 2R6 47 1R17 64 2R4 92 3R2 50 1R20 77 2R17

12. Bus tickets to Fairfield are 20¢ each. How many tickets can Fred buy for 60¢? 3 for 90¢? 4, 10¢ over

13. How many 30-cent movie tickets can Jim buy for 60¢? 2

Larger Dividends

1. **Problem** All the 320 children in Lake School are going to the airport in busses. Each bus can carry 40 children. How many busses are needed to take the 320 children? 8

Explanation You must divide 320 by 40.

$$\begin{array}{r}8\\40\overline{)320}\\\underline{320}\end{array}$$

(1) **Divide.** When the divisor is 40, you divide by 4. You cannot divide the 3 of 320 by 4 but you can divide 32 by 4. Think, "How many 4's are there in 32?" Since there are eight 4's in 32, write 8 over the last figure of 320.

(2) **Multiply** 40 by 8, which gives 320. Write 320.

(3) **Subtract** 320 from 320. Since there is no remainder, the work is finished.

2. The 30 children in Bill's class made 150 stars and bells for the Christmas tree. How many things, on the average, did each one make? 5

3. Mary sold 180 Christmas cards. She sold 20 in a package. How many packages did Mary sell? 9

Divide. Check your work by multiplying: Stress.

4. $\begin{array}{r}7\\30\overline{)210}\end{array}$ $\begin{array}{r}6\\60\overline{)360}\end{array}$ $\begin{array}{r}\text{4R3}\\40\overline{)163}\end{array}$ $\begin{array}{r}\text{8R7}\\20\overline{)167}\end{array}$ $\begin{array}{r}7\\70\overline{)490}\end{array}$

5. $\begin{array}{r}\text{7R9}\\50\overline{)359}\end{array}$ $\begin{array}{r}6\\20\overline{)120}\end{array}$ $\begin{array}{r}\text{5R3}\\70\overline{)353}\end{array}$ $\begin{array}{r}7\\40\overline{)280}\end{array}$ $\begin{array}{r}\text{9R13}\\30\overline{)283}\end{array}$

6. $\begin{array}{r}\text{2R37}\\60\overline{)157}\end{array}$ $\begin{array}{r}\text{6R13}\\40\overline{)253}\end{array}$ $\begin{array}{r}\text{8R11}\\30\overline{)251}\end{array}$ $\begin{array}{r}5\\50\overline{)250}\end{array}$ $\begin{array}{r}\text{9R13}\\20\overline{)193}\end{array}$

7. $\begin{array}{r}\text{7R11}\\20\overline{)151}\end{array}$ $\begin{array}{r}\text{9R17}\\70\overline{)647}\end{array}$ $\begin{array}{r}9\\40\overline{)360}\end{array}$ $\begin{array}{r}\text{7R13}\\60\overline{)433}\end{array}$ $\begin{array}{r}4\\30\overline{)120}\end{array}$

8. $\begin{array}{r}\text{5R11}\\40\overline{)211}\end{array}$ $\begin{array}{r}8\\60\overline{)480}\end{array}$ $\begin{array}{r}\text{6R17}\\30\overline{)197}\end{array}$ $\begin{array}{r}\text{9R9}\\20\overline{)189}\end{array}$ $\begin{array}{r}\text{8R37}\\50\overline{)437}\end{array}$

9. $\begin{array}{r}5\\30\overline{)150}\end{array}$ $\begin{array}{r}\text{6R13}\\50\overline{)313}\end{array}$ $\begin{array}{r}9\\20\overline{)180}\end{array}$ $\begin{array}{r}8\\70\overline{)560}\end{array}$ $\begin{array}{r}\text{8R11}\\40\overline{)331}\end{array}$

10. $\begin{array}{r}\text{7R5}\\20\overline{)145}\end{array}$ $\begin{array}{r}\text{6R3}\\40\overline{)243}\end{array}$ $\begin{array}{r}\text{5R23}\\60\overline{)323}\end{array}$ $\begin{array}{r}\text{8R7}\\30\overline{)247}\end{array}$ $\begin{array}{r}9\\50\overline{)450}\end{array}$

11. $\begin{array}{r}4\\60\overline{)240}\end{array}$ $\begin{array}{r}\text{6R19}\\70\overline{)439}\end{array}$ $\begin{array}{r}\text{7R33}\\50\overline{)383}\end{array}$ $\begin{array}{r}9\\60\overline{)540}\end{array}$ $\begin{array}{r}\text{3R7}\\50\overline{)157}\end{array}$

If pupils have difficulty with placement of quotient figures, explain that we are dividing 320 "ones" since 3 hundreds (and 32 tens) cannot be divided by 40 and have hundreds (or tens) in answer.

Introduce division by 2-figure divisors ending in 1.

Buying Milk

1. **Problem** Mrs. Wood bought 124 qt. of milk in October. What was the average number of quarts she had per day? 4

Explanation Since 31 is close to 30, there are about as many 31's in 124 as there are 30's in 124. When the divisor is 30, you divide by 3. So divide 12 by 3 to find the quotient figure. Tell how to finish the work.

$$\begin{array}{r} 4 \\ 31\overline{)124} \\ \underline{124} \end{array}$$

2. Mrs. King has a large family. She bought 217 qt. of milk in October. What was the average number of quarts she had per day? 7

3. In November Mrs. West bought 150 qt. of milk. What was the average number of quarts she had per day? 5

4. The school lunchroom was open 20 da. last month. They used 180 gal. of milk in that time. What was the average number of gallons of milk used per day? 9

Divide. Check your work by multiplying: Stress.

5. $\overset{3}{21\overline{)63}}$ $\overset{8}{31\overline{)248}}$ $\overset{6}{33\overline{)198}}$ $\overset{7}{21\overline{)147}}$ $\overset{4}{32\overline{)128}}$

6. $\overset{2R5}{24\overline{)53}}$ $\overset{8R11}{21\overline{)179}}$ $\overset{6}{42\overline{)252}}$ $\overset{6}{23\overline{)138}}$ $\overset{9}{42\overline{)378}}$

7. $\overset{4R1}{22\overline{)89}}$ $\overset{8R29}{30\overline{)269}}$ $\overset{5}{34\overline{)170}}$ $\overset{6R3}{32\overline{)195}}$ $\overset{5R17}{41\overline{)222}}$

8. $\overset{3}{25\overline{)75}}$ $\overset{6R16}{41\overline{)262}}$ $\overset{7}{43\overline{)301}}$ $\overset{9R3}{20\overline{)183}}$ $\overset{6R4}{31\overline{)190}}$

9. Divide by 31: 186 6 279 9 157 5R2 111 3R18 137 4R13 199 6R13

10. Divide by 41: 164 4 369 9 209 5R4 130 3R7 287 7 333 8R5

11. Divide by 21: 129 6R3 189 9 130 6R4 178 8R10 116 5R11 150 7R3

12. Divide by 32: 160 5 200 6R8 291 9R3 259 8R3 100 3R4 224 7

13. Divide by 51: 153 3 258 5R3 408 8 104 2R2 357 7 459 9

More Practice. See ⑨ on page 313.

Do ex. 1-4 orally with pupils. Stress proper placement of quotient figures (see pages 78-80) and that we divide by first figure of divisor (rounded off). Use "More Practice" page for individual pupil assistance.

Oral Review

1. Count by 2's from 64 to 98;(1) by 3's from 120 to 156.(2) (1) 64,66,68,70, 72,74,76,78,80,82,84,86,88,90,92,94,96,98; (2) 120,123,126,129,132,135,138,141,144,147,150,153,156

2. Count by 4's from 82 to 106;(1) by 6's from 81 to 135.(2) (1) 82,86,90, 94,98,102,106; (2) 81,87,93,99,105,111,117,123,129,135

Add 5 to each number.(1) Add 6;(2) add 7;(3) add 10:(4)

(1),(2) 24,25 49,50 83,84 42,43 31,32 90,91 18,19 57,58
(3),(4) **3.** 19 26,29 44 51,54 78 85,88 37 44,47 26 33,36 85 92,95 13 20,23 52 59,62
76,77 95,96 62,63 94,95 50,51 39,40 33,34 71,72
4. 71 78,81 90 97,100 57 64,67 89 96,99 45 52,55 34 41,44 28 35,38 66 73,76

Find these sums:

5. 9 + 6 + 2 17 6 + 4 + 5 15 2 + 3 + 5 + 1 11
6. 7 + 4 + 8 19 9 + 6 + 6 21 4 + 3 + 3 + 5 15
7. 8 + 6 + 3 17 7 + 4 + 6 17 4 + 2 + 5 + 6 17

Find the remainders:

8. 16 − 7 9 10 − 4 6 26 − 4 22 92 − 5 87 82 − 10 72
9. 18 − 9 9 12 − 5 7 39 − 3 36 56 − 9 47 59 − 20 39
10. 13 − 4 9 11 − 3 8 86 − 5 81 33 − 7 26 67 − 30 37

11. Multiply each number by 10: 37 370 49 490 18 180 70 700 52 520
6100 2600 8300 9500
12. Multiply each number by 100: 61↓ 26↓ 83↓ 95↓ 74 7400
13. Find $\frac{2}{3}$ of each number: 18 12 27 18 12 8 30 20 9 6 21 14
14. How many weeks and days are there in October? 4 wk., 3 da. over
15. How many 3-cent stamps can you buy with 2 dimes? 6, 2¢ over
16. If 4 oranges cost 25¢, what is the cost of 1 orange? $6\frac{1}{4}$ ¢
38,39,40,50
17. Make change from 50¢ for things that cost 38¢;↓ 22¢.←
22,23,24,25,50
18. How many minutes is it from 8:40 A.M. to 9:07 A.M.? 27
19. How many quarts are there in 1 gal.? 4 in $\frac{3}{4}$ gal.? 3
20. How many inches are there in $\frac{1}{4}$ yd.? 9 in $\frac{3}{4}$ yd.? 27
21. How many ounces are there in 1 lb.? 16 in $\frac{5}{8}$ lb.? 10

As pupils give answers keep list of errors or hesitancy. Note areas of class or individual weaknesses and plan remedial programs using developmental material found on pages related to pupils' difficulties.

First discuss pupils' own experiences in earning money. In doing problems, remind pupils to look for and answer hidden questions. Then let pupils make up problems based on own experiences, for class to solve.

Earning Money

Today all the children in Miss Wood's room made problems about earning money. Can you work their problems?

1. Jack said, "I had a garden last summer and sold vegetables. I made $4.50 on carrots, $3.85 on beans, $4.75 on corn, and $3.45 on pumpkins. How much did I make in all?" $16.55

2. Ann said, "I made and sold 25 lb. of candy. I charged $.80 a pound for it. The sugar and other things I used cost $6.75. How much money did I make?" $13.25

3. Betty said, "I helped Mrs. Green take care of her baby. She paid me $.60 an hour. In the summer I worked 54 hr. for her. How much did I earn?" $32.40

4. Dick said, "I cut Mr. Brown's grass 18 times this summer and fall. He paid me $1.15 each time. I also earned $9.75 carrying packages on my bicycle. How much money did I earn all together?" $30.45

5. Bill said, "Every week Tom, Andy, and I collect old newspapers and we sell them when we get enough. Last year we earned $78 that way. We divided the money equally. How much was my share of it?" $26

6. Peggy said, "I sold all kinds of greeting cards and got $47.25 for them. I had to send all but $\frac{1}{5}$ of the money to the company that supplied the cards. How much money did I keep for selling the cards?" $9.45

7. Jim said, "I made birdhouses and tie holders from wood. The wood and other things cost $10.30. I got $13.50 for the birdhouses and $15.00 for the tie holders. How much money did I make?" $18.20

Extend long division to divisors ending in 1, 2, 3, 4, or 5. Present rule for estimating quotient figures where 2-figure divisor ends in 1, 2, 3, 4, or 5 (Rule I).

Two-Place Quotients

1. **Problem** Last month 21 boys together collected 798 lb. of old newspapers. Find the average number of pounds collected per boy.

Explanation Divide 798 by 21. Emphasize meaning of term.

$$\begin{array}{r} 38 \\ 21\overline{)798} \\ \underline{63} \\ 168 \\ \underline{168} \end{array}$$

(1) **Divide** 79 by 21. 79 is the **partial dividend** because it is the part of the dividend you use to get the first quotient figure. To divide 79 by 21, think, "There are three 2's in 7." Write 3 in the quotient over the 9 of 79.

(2) **Multiply** 21 by 3, which gives 63. Write 63 under 79.

(3) **Subtract** 63 from 79, which leaves 16.

(4) **Compare** the remainder 16 with the divisor 21. 16 is less than 21, so 3 is the right quotient figure.

(5) **Bring down** 8 and write it after 16, making a new partial dividend of 168.

Check

$$\begin{array}{r} 38 \\ \underline{21} \\ 38 \\ \underline{76} \\ 798 \end{array}$$

Repeat these 5 steps for the next quotient figure.

(1) **Divide** 168 by 21. Think, "16 ÷ 2 = 8." Write 8 over the 8 of the dividend.

(2) **Multiply** 21 by 8, which gives 168. Write 168 under 168.

(3) **Subtract** 168 from 168, which leaves 0.

(4) **Compare** the remainder 0 with the divisor 21. Since 0 is less than 21, 8 is the right quotient figure.

(5) There is no other figure in the dividend to bring down, so the division is completed. The quotient is 38. The average number of pounds collected per boy was 38 lb. Check by multiplying 38 by 21, as shown above.

2. Last spring the 21 boys collected 987 lb. of old papers. Find the average number of pounds collected per boy. 47

▶ On paper divide 987 by 21, writing the work as shown in ex. 1. In getting each quotient figure follow the 5 steps given above.

In discussion of ex. 1, point out that 7 hundreds cannot be divided by 21 and have hundreds in answer. Therefore 79 "tens" are divided first, and 3 is in tens place since tens were divided, 8 is in ones place since 168 ones were divided.

3. Learn these 5 steps in finding each quotient figure:

(1) **Divide** the partial dividend by the divisor.

(2) **Multiply** the divisor by the quotient figure.

(3) **Subtract.**

(4) **Compare** the remainder with the divisor. The remainder should always be less than the divisor.

(5) **Bring down** the next figure of the dividend.

4. Study these division examples to see if you can follow the 5 steps in finding each quotient figure. Then copy each dividend and divisor on paper and divide. Check the work:

$$\begin{array}{r} 32 \\ 21\overline{)672} \\ \underline{63} \\ 42 \\ \underline{42} \end{array} \qquad \begin{array}{r} 31 \\ 32\overline{)992} \\ \underline{96} \\ 32 \\ \underline{32} \end{array} \qquad \begin{array}{r} 23\text{ R7} \\ 23\overline{)536} \\ \underline{46} \\ 76 \\ \underline{69} \\ 7 \end{array} \qquad \begin{array}{r} 23\text{ R2} \\ 31\overline{)715} \\ \underline{62} \\ 95 \\ \underline{93} \\ 2 \end{array}$$

Emphasize.

When a two-place divisor ends in 1, 2, 3, 4, or 5, divide by the first figure of the divisor to find each quotient figure.

Divide and check. In each exercise divide by the first figure of the divisor to find each quotient figure:

5. $\begin{array}{r} 32 \\ 22\overline{)704} \end{array}$ $\quad\begin{array}{r} 21\text{R}7 \\ 31\overline{)658} \end{array}$ $\quad\begin{array}{r} 12 \\ 40\overline{)480} \end{array}$ $\quad\begin{array}{r} 42\text{R}4 \\ 21\overline{)886} \end{array}$ $\quad\begin{array}{r} 34\text{R}9 \\ 20\overline{)689} \end{array}$

6. $\begin{array}{r} 23\text{R}12 \\ 21\overline{)495} \end{array}$ $\quad\begin{array}{r} 33\text{R}3 \\ 22\overline{)729} \end{array}$ $\quad\begin{array}{r} 21 \\ 42\overline{)882} \end{array}$ $\quad\begin{array}{r} 12 \\ 34\overline{)408} \end{array}$ $\quad\begin{array}{r} 13 \\ 25\overline{)325} \end{array}$

7. $\begin{array}{r} 23\text{R}3 \\ 30\overline{)693} \end{array}$ $\quad\begin{array}{r} 21\text{R}11 \\ 42\overline{)893} \end{array}$ $\quad\begin{array}{r} 22 \\ 41\overline{)902} \end{array}$ $\quad\begin{array}{r} 21 \\ 35\overline{)735} \end{array}$ $\quad\begin{array}{r} 34\text{R}11 \\ 20\overline{)691} \end{array}$

8. $\begin{array}{r} 13 \\ 32\overline{)416} \end{array}$ $\quad\begin{array}{r} 14 \\ 22\overline{)308} \end{array}$ $\quad\begin{array}{r} 12 \\ 25\overline{)300} \end{array}$ $\quad\begin{array}{r} 12\text{R}5 \\ 42\overline{)509} \end{array}$ $\quad\begin{array}{r} 12\text{R}4 \\ 45\overline{)544} \end{array}$

9. Last month in 21 days the school store sold 903 pencils. How many pencils, on the average, were sold per day? 43

Emphasize that 5 steps must be used in finding "each" quotient figure, and stress importance of comparison step. Have pupils explain their work in ex. 5–9, stressing reasons for placement of quotient figures.

Extend work of pages 84-85 to include 4-figure dividends, where each figure of dividend is found correctly on first trial.

Selling Tickets

1. **Problem** The schools of High Point have 2088 tickets to sell for a travel movie next week. If 32 rooms divide the tickets equally, how many tickets should each room sell? 65 Will any tickets be left over? Yes If so, how many rooms should each sell one extra ticket? 8

Explanation You cannot use 20 for the first partial dividend because 20 is less than the divisor. So use 208 for the partial dividend. Think, "How many 3's are there in 20?" Tell how to finish the work.

$$\begin{array}{r} 65\text{ R}8 \\ 32\overline{)2088} \\ \underline{192} \\ 168 \\ \underline{160} \\ 8 \end{array}$$

You see there are 8 tickets left over. This means that 8 rooms will each have one extra ticket to sell, or 66 tickets.

2. In ex. 1, suppose only 31 rooms divide the 2088 tickets equally. Then how many tickets should each room sell? 67 How many rooms should each sell one extra ticket? 11

Divide. Check your work by multiplying: Have pupils explain some examples.

3.	$\begin{array}{r}52\\22\overline{)1144}\end{array}$	$\begin{array}{r}86\\40\overline{)3440}\end{array}$	$\begin{array}{r}72\\21\overline{)1512}\end{array}$	$\begin{array}{r}44\\44\overline{)1936}\end{array}$	$\begin{array}{r}51\text{R}2\\35\overline{)1787}\end{array}$
4.	$\begin{array}{r}42\\35\overline{)1470}\end{array}$	$\begin{array}{r}45\text{R}3\\31\overline{)1398}\end{array}$	$\begin{array}{r}96\\20\overline{)1920}\end{array}$	$\begin{array}{r}31\\33\overline{)1023}\end{array}$	$\begin{array}{r}32\\34\overline{)1088}\end{array}$
5.	$\begin{array}{r}63\\21\overline{)1323}\end{array}$	$\begin{array}{r}23\text{R}4\\45\overline{)1039}\end{array}$	$\begin{array}{r}81\\22\overline{)1782}\end{array}$	$\begin{array}{r}43\\34\overline{)1462}\end{array}$	$\begin{array}{r}71\text{R}12\\22\overline{)1574}\end{array}$
6.	$\begin{array}{r}33\text{R}11\\32\overline{)1067}\end{array}$	$\begin{array}{r}57\text{R}13\\30\overline{)1723}\end{array}$	$\begin{array}{r}51\\34\overline{)1734}\end{array}$	$\begin{array}{r}63\\42\overline{)2646}\end{array}$	$\begin{array}{r}63\\31\overline{)1953}\end{array}$
7.	$\begin{array}{r}52\\23\overline{)1196}\end{array}$	$\begin{array}{r}62\text{R}7\\31\overline{)1929}\end{array}$	$\begin{array}{r}53\text{R}2\\32\overline{)1698}\end{array}$	$\begin{array}{r}36\\44\overline{)1584}\end{array}$	$\begin{array}{r}51\\23\overline{)1173}\end{array}$
8.	$\begin{array}{r}71\text{R}8\\21\overline{)1499}\end{array}$	$\begin{array}{r}52\text{R}4\\33\overline{)1720}\end{array}$	$\begin{array}{r}25\text{R}5\\43\overline{)1080}\end{array}$	$\begin{array}{r}41\text{R}9\\41\overline{)1690}\end{array}$	$\begin{array}{r}33\text{R}3\\35\overline{)1158}\end{array}$

9. Divide by 33: 792 24 1188 36 1485 45 1690 51R7 2046 62

10. Divide by 21: 945 45 1134 54 1743 83 1953 93 1598 76R2

More Practice. See ⑩ on page 313.

In ex. 1 stress fact that 20 hundreds cannot be divided by 32, therefore 208 "tens" are used as first partial dividend. Emphasize reasons for placement of quotient figures.

Review basic skills in the four fundamental processes.

Keeping in Practice

Multiply and check the work:

1.	34,153 49 × 697	127,215 257 × 495	$5830.50 690 × $8.45	$1789.42 38 × $47.09
2.	15,447 57 × 271	172,072 314 × 548	$3058.70 419 × $7.30	$1103.70 65 × $16.98
3.	37,392 41 × 912	604,428 723 × 836	$3425.04 568 × $6.03	$2059.20 80 × $25.74
4.	49,910 62 × 805	170,156 236 × 721	$3970.68 489 × $8.12	$963.60 73 × $13.20

Copy in columns, add, and check:

5.	54, 16, 98, 61, 22, 77 328	36, 59, 45, 98, 60, 27 325
6.	17, 89, 65, 87, 46, 54 358	18, 85, 70, 52, 71, 37 333
7.	63, 33, 77, 55, 25, 46 299	43, 14, 99, 46, 89, 93 384
8.	26, 73, 49, 44, 87, 84 363	23, 39, 24, 97, 83, 55 321

9. Find the cost of 250 books at $3.98 each. $995.00

10. Find the sum of $1.51, $2.04, $.87, and $.79. $5.21

11. Find the difference between $50.00 and $43.19. $6.81

Subtract and check the work:

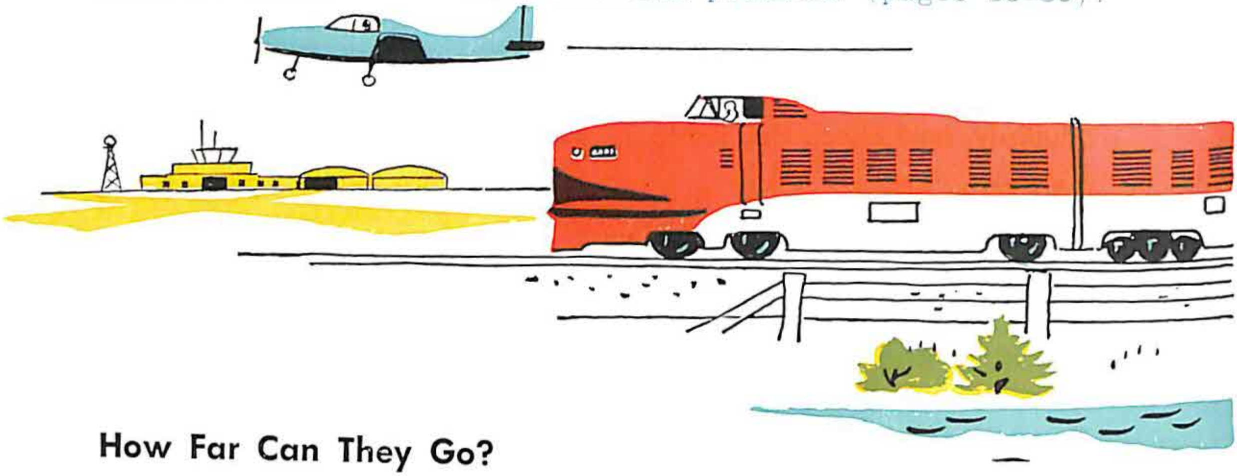
12.	8473 6789 1684	1229 247 982	3656 1999 1657	9000 7453 1547	3745 3287 458
13.	6352 5586 766	4458 1468 2990	6700 6596 104	4124 2436 1688	3000 2835 165

Divide and check the work:

14.	56R3 5)283	118 7)826	75 3)225	262R4 7)1838	51 22)1122
15.	97 8)776	98 2)196	64 9)576	257 5)1285	84 30)2520
16.	25R5 6)155	70 7)490	87 4)348	163 8)1304	62R11 32)1995
17.	87R2 9)785	86 6)516	54 8)432	341R1 6)2047	52R20 41)2152

Observe work habits of pupils and determine type of problem which is difficult for particular child. Group for reteaching (stress meanings) or drill on facts.

Introduce distance, rate, and time problems (pages 88-89).



How Far Can They Go?

1. Last summer Andy had a ride in a fast boat. It went at a speed of 17 mi. per hour. At that speed, how many miles could it go in 2 hr.? 34 in 3 hr.? 51

2. On the open road Mary's father drives his car at a speed of 45 mi. an hour. At that rate, how many miles can he drive in 2 hr.? 90 in 3 hr.? 135

3. The number of miles traveled in an hour is called the **rate** or **speed.** In ex. 1, the speed of the boat is 17 mi. per hour. In ex. 2, the rate at which Mary's father drives his car is 45 mi. per hour. What is the rate in ex. 4? 60 mi. per hr.

4. A train travels at a speed of 60 mi. per hour. At that rate, how many miles can it go in 2 hr.? 120 in $\frac{1}{2}$ hr.? 30 in $\frac{3}{4}$ hr.? 45

5. Bill says he can walk 3 mi. in an hour. At that rate, how many miles can Bill walk in 2 hr.? 6

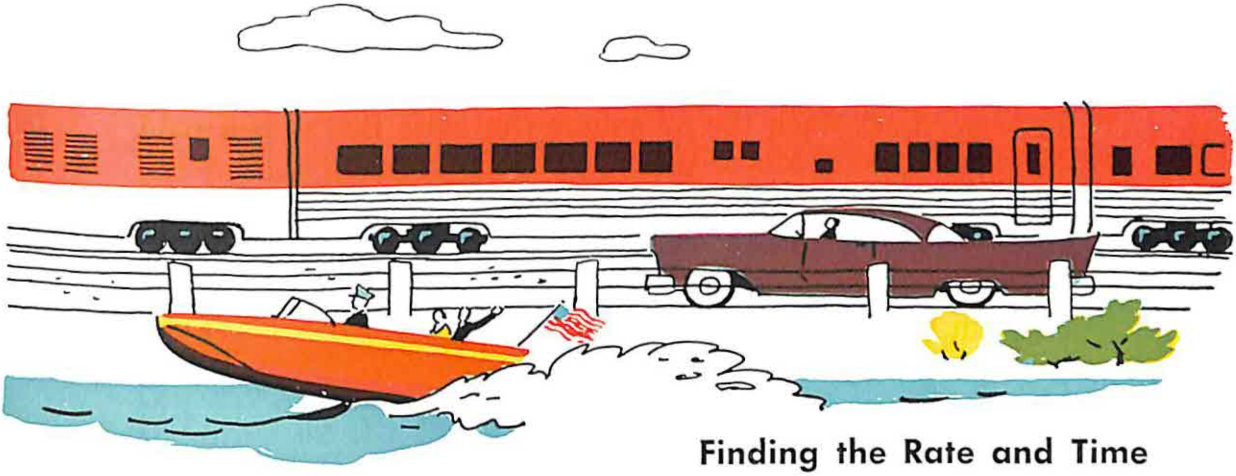
6. Mr. Jackson can walk 4 mi. an hour. How many miles can he walk in 2 hr.? 8 in $\frac{1}{2}$ hr.? 2 in 15 min.? 1

7. The average speed of a small airplane is 175 mi. an hour. At that rate, how far can it travel in 2 hr.? 350 mi. in 3 hr.? 525 mi.

Stress.

To find the distance traveled, multiply the rate in miles per hour by the number of hours.

Review meaning of word "per" first. Then do problems with pupils, leading them to generalization, boxed above. Have pupils make up similar problems, based on travel experiences, for class to solve.



Finding the Rate and Time

1. Ann rode her bicycle 12 mi. in 2 hr. How many miles an hour, or at what rate, did Ann ride? 6 mi.

2. In ex. 1 the distance is 12 mi. and the time is 2 hr. What do you do in ex. 1 to find the rate? Divide What is the distance in ex. 3? in ex. 4? 2340 mi.; 1134 mi.

3. Jim read a story about an airplane that went 2340 mi. in 4 hr. Find the average speed in miles per hour at which that plane traveled. 585 mi.

4. On a train trip Susan rode 1134 mi. in 21 hr. How many miles an hour did that train average? 54

5. Mr. Chase figures his average speed on long trips in his car is 40 mi. an hour. He wants to drive 200 mi. tomorrow. About how many hours should he allow for the trip if he does not stop on the way? 5

6. Bill averages 7 mi. an hour on his bicycle. How many hours will it take him to make a trip of 14 mi.? 2 of 21 mi.? 3 of 28 mi.? 4

Stress.

To find the rate, divide the distance by the number of hours. To find the number of hours, divide the distance by the rate.

Again, discuss problems with pupils and lead them to generalizations, boxed above. Let some pupils look up and report to class about increase in rates of speed of cars, trains, planes, in past 25 years.

Dividing Money

1. **Problem** Last week the 32 children in Miss Bell's class paid \$8.75 to have a school party. The 32 children shared the cost equally. How much did each child pay? \$.27 How many children paid an extra cent? 11

Explanation You divide dollars and cents in long division just as you divide other numbers. Be sure to put each quotient figure in the right place. Then put a decimal point in the quotient above the decimal point in \$8.75. The answer is \$.27 with a remainder of 11¢. If each child pays \$.27, there will be 11¢ still to be paid. 11 children will each have to pay an extra cent. Check the work.

$$\begin{array}{r} \$.27 \\ 32\overline{)\$8.75} \\ 6\,4 \\ \hline 2\,35 \\ 2\,24 \\ \hline 11 \end{array} \qquad \begin{array}{r} \text{Check} \\ \$.27 \\ 32 \\ \hline 54 \\ 8\,1 \\ \hline \$8.64 \\ .11 \\ \hline \$8.75 \end{array}$$

2. The 33 workbooks for Miss Black's class cost \$23.76. Find the cost of 1 workbook. \$.72

3. Divide by 65: \$9.10 \$.14 \$53.30 \$.82 \$23.40 \$.36 \$59.15 \$.91

4. Divide by 72: \$9.36 \$.13 \$27.47 \$.38R11¢ \$38.88 \$.54 \$45.36 \$.63

5. Divide by 41: \$6.56 \$.16 \$21.73 \$.53 \$19.30 \$.47R3¢ \$26.24 \$.64

Divide and check your work: Have pupils explain placement of quotient figures.

6.	$\begin{array}{r}\$.15\\32\overline{)\$4.80}\end{array}$	$\begin{array}{r}\$.61\\33\overline{)\$20.13}\end{array}$	$\begin{array}{r}\$.56\text{R}16¢\\61\overline{)\$34.32}\end{array}$	$\begin{array}{r}\$.56\text{R}11¢\\52\overline{)\$29.23}\end{array}$
7.	$\begin{array}{r}\$.22\\24\overline{)\$5.28}\end{array}$	$\begin{array}{r}\$.72\text{R}8¢\\21\overline{)\$15.20}\end{array}$	$\begin{array}{r}\$.45\text{R}12¢\\65\overline{)\$29.37}\end{array}$	$\begin{array}{r}\$.82\\54\overline{)\$44.28}\end{array}$
8.	$\begin{array}{r}\$.21\\35\overline{)\$7.35}\end{array}$	$\begin{array}{r}\$.52\text{R}7¢\\34\overline{)\$17.75}\end{array}$	$\begin{array}{r}\$.33\\32\overline{)\$10.56}\end{array}$	$\begin{array}{r}\$.33\\75\overline{)\$24.75}\end{array}$
9.	$\begin{array}{r}\$.17\text{R}5¢\\52\overline{)\$8.89}\end{array}$	$\begin{array}{r}\$.72\\22\overline{)\$15.84}\end{array}$	$\begin{array}{r}\$.24\text{R}7¢\\93\overline{)\$22.39}\end{array}$	$\begin{array}{r}\$.47\\83\overline{)\$39.01}\end{array}$
10.	$\begin{array}{r}\$.15\text{R}2¢\\63\overline{)\$9.47}\end{array}$	$\begin{array}{r}\$.18\\71\overline{)\$12.78}\end{array}$	$\begin{array}{r}\$.26\\62\overline{)\$16.12}\end{array}$	$\begin{array}{r}\$.32\text{R}7¢\\74\overline{)\$23.75}\end{array}$
11.	$\begin{array}{r}\$.31\text{R}5¢\\25\overline{)\$7.80}\end{array}$	$\begin{array}{r}\$.53\text{R}8¢\\55\overline{)\$29.23}\end{array}$	$\begin{array}{r}\$.34\\84\overline{)\$28.56}\end{array}$	$\begin{array}{r}\$.61\\43\overline{)\$26.23}\end{array}$

In ex. 1, ask pupils "why" 2 in quotient is placed over 7 in dividend (since 8 dollars cannot be divided by 32, it is changed to dimes; then 87 dimes are divided and answer is in dimes place). Stress Rule I in estimating quotients.

Maintain problem-solving skills involving various operations.

Review Problems

1. In 22 days last month Dick sold 1364 newspapers in all. Find the average number of papers he sold per day. 62

2. Ann bought $\frac{3}{4}$ lb. of salted peanuts at \$.80 a pound. How much did Ann pay for them? \$.60

3. Miss Case's car had been driven 6785 mi. before she left for a vacation trip. When she returned, the car had been driven 8450 mi. in all. How many miles did Miss Case drive on the trip? 1665

4. Mary's new spring coat cost \$19.75. Her new dress cost \$9.89. How much did the coat and dress together cost? \$29.64

5. Mrs. Brown bought 3 yd. of wool cloth at \$4.75 a yard. How much change did she get from a 20-dollar bill? \$5.75

6. Jim's arithmetic marks in 4 weekly tests were 82, 87, 88, 91. Find Jim's average test mark. 87

7. Mr. King rides to and from the city 5 days a week. A 20-trip bus ticket costs \$10.45. A single-trip ticket costs \$.63. How much can Mr. King save on 20 bus trips if he buys a 20-trip ticket? \$2.15

8. The school bookstore bought 175 spelling books at \$1.56 apiece. What was the cost of these books? \$273.00

9. Mr. Black bought 30 radios and paid \$1020 for them. What did 1 radio cost him? \$34

10. Jack bought 550 Christmas cards. He sold them in boxes with 25 cards in each box. He charged \$.98 a box. How much did Jack get for the cards? \$21.56

11. The cooking class made 300 cookies one day. They were divided equally among the 21 girls in the class. How many cookies did each girl get? 14 Were any cookies left over? 6

12. Last week Peter worked in the school store. He sold 85 ball-point pens at \$1.19 each. How much money did Peter take in from the sale of these pens? \$101.15

After pupils complete problems, have different pupils explain answers, giving reasons for process or processes used. Group pupils who had difficulty and try to determine causes of errors. Let others work at arithmetic corner.

Oral Practice

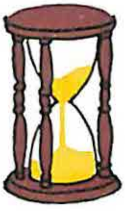
1. Read 11:40 A.M. in three different ways. Eleven forty, 40 minutes past 11, 20 minutes to twelve
2. How many more than 14 is 25? 11
3. What is the sum of 30 and 19? 49 of 25 and 20? 45
4. Find the difference between 60 and 15. 45
5. How many feet are there in 9 yd.? 27 in 6 yd.? 18
6. How many yards are there in 9 ft.? 3 in 6 ft.? 2
7. Which is larger, $\frac{1}{4}$ pie or $\frac{1}{2}$ pie? $\frac{1}{2}$
8. How many are 0 + 4? 4 0 × 4? 0 0 ÷ 4? 0 4 − 0? 4
9. Find the time between 9:20 A.M. and 10:05 A.M. 45 min.
10. Which is more, 10 qt. or 3 gal.? 3 gal. 2 ft. or 20 in.? 2 ft.
11. What is the time $\frac{1}{2}$ hr. later than 2:20 P.M.? 2:50

Written Practice

12. What is the quotient when you divide 2646 by 42? 63
13. Find the sum of 3607, 1946, 5008, and 4993. 15,554
14. Write the number that is 2365 less than 6000. 3635
15. Find the average of 73, 68, 50, 86, 75, and 80. 72
16. Find the difference between $50.75 and $19.98. $30.77
17. Find the product of 429 and 607; 260,403 of 308 and 419. 129,052
18. Write the number that is 3328 more than 1795. 5123
19. How many 31's are there in 806? 26 in 2697? 87
20. What is the remainder when 996 is taken from 4002? 3006
21. Add these numbers: 127, 453, 96, 205, 19, 285. 1185
22. How much will $\frac{3}{4}$ lb. of nuts cost at $.80 a pound? $.60
23. If you take 294 from 600, what is the remainder? 306

Note in ex. 12-23 that understanding of vocabulary is necessary to do these problems. Check to see if some pupils need further review of arithmetic terms.

Reteach measures of time and extend to include century, decade, score.



Measuring Time

1. Before watches and clocks were invented people had other ways of telling time. Look at the pictures and see if you have ever heard of these ways of telling time. Are any of these ways used today?

2. Learn this table of time:

Add measures of time to class chart (page 27).

7 days (da.) = 1 week (wk.)
About 52 weeks (wk.) = 1 year (yr.)
365 days or 12 months (mo.) = 1 year (yr.)
366 days (da.) = 1 leap year
100 years (yr.) = 1 century

3. Leap years come every 4 years. To tell whether a year is a leap year, divide the year by 4. If there is no remainder, the year is a leap year. The years 1952 and 1956 were leap years. Century years, such as 1900 and 2000, are leap years only when they can be divided by 400 without a remainder. Which of these years are leap years: 1855, 1860, 1900, 1908, 1932, 1942, 1948, 1960, 2000? 1860, 1908, 1932, 1948, 1960, 2000

4. The words **decade** and **score** are also used in counting time. A **decade** is 10 years; a **score** is 20 years. Mr. Green said to Jim, "I am 4 score and 2 years old and I have lived in this house 6 decades." How old is Mr. Green? 82 yr. How long has he lived in that house? 60 yr. How many years are 3 score and 10 years? 70 5 decades? 50 2 decades? 20

5. How many centuries are there in 200 yr.? 2 in 500 yr.? 5

Have pupils investigate various ways of telling time and report findings to class. They might also enjoy filmstrip on the history of telling time (see G-107). Do not expect all pupils to master new concepts, but present them from appreciation viewpoint.

Although Rule I still applies on pages 94-95, it is necessary to correct quotient figures. Discuss ex. 1 carefully with pupils, stressing 5 steps used and reasons for placement of quotient figures.

Correcting Quotient Figures

1. Problem The 245 children in Hunter School are going in groups of 35 to see how milk is bottled. How many groups in all will there be? 7

Explanation Betty thinks, "24 ÷ 3 = 8. 8 × 35 = 280." But 280 is larger than 245, so she cannot subtract 280 from 245. This shows that 8 is too large as the quotient.

$$\begin{array}{r} 8 \\ 35\overline{)245} \\ \underline{280} \end{array}$$

Then Betty tries 7 as the quotient. She multiplies 35 by 7 and gets 245. When she subtracts, the remainder is 0. Since 0 is less than 35, the quotient is right.

$$\begin{array}{r} 7 \\ 35\overline{)245} \\ \underline{245} \end{array}$$

Emphasize.

When the quotient figure is too large, try the next smaller figure. When the quotient figure is right, the remainder is smaller than the divisor.

2. If 210 children in Brooks School go in groups of 35, how many groups will there be? 6

Divide and check. If the quotient figure is too large, try the next smaller number. Do some orally.

3.	$22\overline{)149}$ 6R17	$35\overline{)260}$ 7R15	$23\overline{)184}$ 8	$31\overline{)180}$ 5R25	$64\overline{)481}$ 7R33
4.	$31\overline{)275}$ 8R27	$55\overline{)400}$ 7R15	$41\overline{)360}$ 8R32	$25\overline{)125}$ 5	$34\overline{)190}$ 5R20
5.	$43\overline{)280}$ 6R22	$21\overline{)185}$ 8R17	$33\overline{)151}$ 4R19	$45\overline{)200}$ 4R20	$35\overline{)160}$ 4R20
6.	$25\overline{)155}$ 6R5	$63\overline{)425}$ 6R47	$22\overline{)188}$ 8R12	$32\overline{)241}$ 7R17	$24\overline{)144}$ 6
7.	$72\overline{)420}$ 5R60	$23\overline{)150}$ 6R12	$54\overline{)301}$ 5R31	$24\overline{)170}$ 7R2	$21\overline{)101}$ 4R17

Extend work of page 94 to include 2-figure quotients.

Watching Quotient Figures

1. Problem The children in 25 rooms in the schools of Watertown raised $900. How many dollars, on the average, did each room raise? $36

Explanation Divide 900 by 25.

Look at A to get the first quotient figure. Think, "There are four 2's in 9." You find that 4 is too large because $4 \times 25 = 100$ and 100 cannot be subtracted from 90. Then try 3 as the first quotient figure. 3 is right because you can subtract 75 from 90 and the remainder 15 is less than the divisor 25.

$$\begin{array}{r} \text{A} \\ 3 \\ 25\overline{)900} \\ \underline{75} \\ 15 \end{array} \qquad \begin{array}{r} \text{B} \\ 36 \\ 25\overline{)900} \\ \underline{75} \\ 150 \\ \underline{150} \end{array}$$

Look at B to get the second quotient figure. Bring down 0 from the dividend. The new partial dividend is 150. Think, "There are seven 2's in 15." 7 is too large; tell why. Try 6. 6 is right; tell why. Each room raised an average of $36. Check by multiplying 36 by 25.

2. Last spring 35 children sold 910 packages of garden seeds. How many packages, on the average, did each child sell? 26

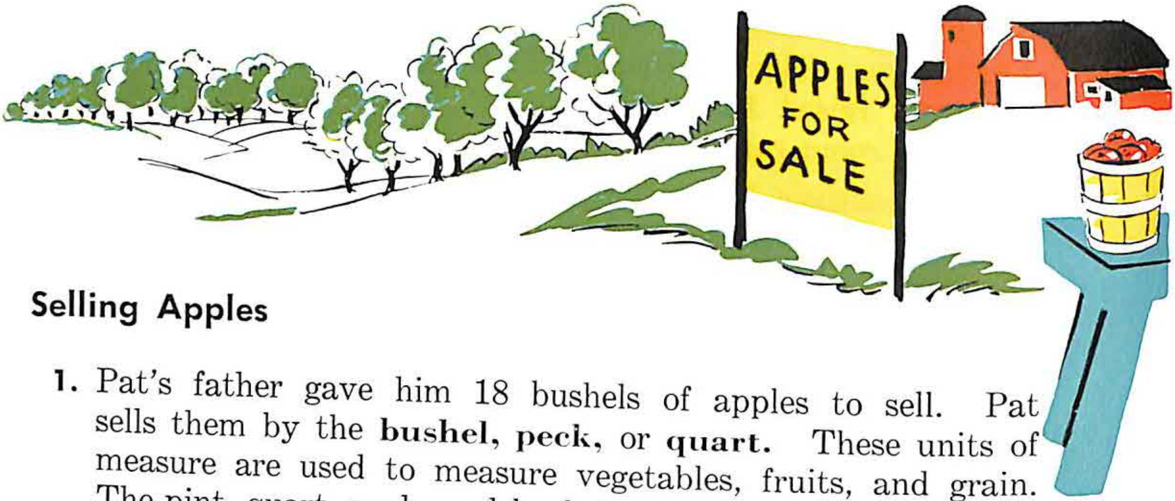
Divide. Check the work by multiplying:

3.	27 23)621	77R23 43)3334	54R5 24)1301	78R32 41)3230	44 25)1100
4.	24 25)600	54 25)1350	75 44)3300	78 23)1794	44R37 45)2017
5.	26R24 34)908	78 45)3510	67 23)1541	67R39 63)4260	57R27 42)2421
6.	25 24)600	85R15 21)1800	83R52 65)5447	66 22)1452	36 35)1260
7.	17R9 35)604	75R21 32)2421	48 34)1632	66R42 43)2880	88R9 22)1945
8.	19 32)608	39R1 41)1600	55 25)1375	74R10 35)2600	55R40 43)2405
9.	32 25)800	62R27 34)2135	73R19 22)1625	46R36 44)2060	53R20 35)1875

More Practice. See ⑪ on page 314. Use to reinforce skill.

Follow development as given in ex. 1 explanation. Be sure pupils understand placement of quotient figures. Stress comparison step in division process and why remainder must be smaller than divisor.

Teach or reteach dry measures (pint, quart, peck, bushel) including abbreviations and equivalences.



Selling Apples

1. Pat's father gave him 18 bushels of apples to sell. Pat sells them by the **bushel, peck,** or **quart.** These units of measure are used to measure vegetables, fruits, and grain. The pint, quart, peck, and bushel are units of **dry measure.** The pint and quart in dry measure are a little larger than the pint and quart in liquid measure.

2. Here is the table of dry measure. Learn it:

Add to measures' chart.

2 pints (pt.) = 1 quart (qt.)
8 quarts (qt.) = 1 peck (pk.)
4 pecks (pk.) = 1 bushel (bu.)

3. Learn the abbreviations for peck and bushel.

4. How many quarts are there in 1 pk.? 8 How many quarts are there in 4 pk.? 32 How many quarts are there in 1 bu.? 32

5. Pat sells apples at $1.00 a peck. How much does he get for 4 pk. of apples? $4.00 How much does he get for 1 bu. when he sells apples by the peck? $4.00

6. When Pat sells apples by the quart, he charges $.15 a quart. How much does he get for 1 pk. sold by the quart? $1.20

7. Pat sells 1 bu. of apples for $3.75. How much more does he get for 1 bu. when he sells the apples by the peck? $.25 when he sells them by the quart? $1.05

If possible, try to display containers used for dry measures so that pupils may become familiar with them. Also, contrast these with ones used for liquid measures for pint and quart so that pupils see that liquid ones are smaller.

$1.00 A PK.
15¢ A QT.
$3.75 A BU.

8. Name three things besides apples that are sold by dry measure.

9. Ann says her mother buys apples by the pound. It is true that some things that used to be sold by dry measure are now sold by the pound. You may live where apples are sold by the pound. Can you give any good reasons for selling apples by the pound instead of by the quart?

10. Find out by what measure these things are sold where you live: apples, berries, cabbage, grain, onions, pears, potatoes, string beans, turnips.

11. In some places fruits like bananas and oranges that used to be sold by the dozen are now sold by the pound. Can you give any good reasons for this?

Tell what number goes in each space:

12. 2 bu. = 8 pk. $\frac{1}{2}$ pk. = 4 qt. $\frac{1}{4}$ bu. = 1 pk.

13. 2 bu. = 64 qt. $\frac{1}{2}$ bu. = 2 pk. $\frac{1}{4}$ pk. = 2 qt.

14. 2 pk. = 16 qt. $\frac{1}{2}$ bu. = 16 qt. $\frac{3}{4}$ bu. = 24 qt.

In ex. 8 and 10 have pupils make charts showing some of the items (cut out from magazines) and the measures used in your community in selling these commodities.

Show how to find quotient figures by inspection.

1 and 0 in the Quotient

1. It is easy to divide when the quotient is 1 or 0. You can see the answer without dividing by the first figure of the divisor. In A, you see 37 is only a little larger than 34, so the quotient figure is 1. The same thing is true in B. When the dividend is only a little larger than the divisor, the quotient is always 1. Emphasize.

A

$$\begin{array}{r} 1 \\ 34\overline{)37} \\ \underline{34} \\ 3 \end{array}$$

B

$$\begin{array}{r} 1 \\ 82\overline{)89} \\ \underline{82} \\ 7 \end{array}$$

Emphasize. **2.** In C, the first quotient figure is 1. The second quotient figure is 0 because the partial dividend 40 is less than 45. Write 0 in the quotient. Multiply 45 by 0, which gives 0. Write 0 under 40 and subtract. The remainder is 40. In D, tell why the second quotient figure is 0.

C

$$\begin{array}{r} 10 \\ 45\overline{)490} \\ \underline{45} \\ 40 \\ \underline{0} \\ 40 \end{array}$$

D

$$\begin{array}{r} 20 \\ 25\overline{)515} \\ \underline{50} \\ 15 \\ \underline{0} \\ 15 \end{array}$$

Divide. When possible, write the quotient figures without dividing by the first figure of the divisor:

3.	1R4 51)55	10R40 51)550	10R77 85)927	81R2 35)2837	50R25 34)1725
4.	1R2 30)32	10R28 30)328	10R80 91)990	39R17 42)1655	12R28 81)1000
5.	1R6 62)68	10R60 62)680	10R70 73)800	50R50 51)2600	41R35 65)2700
6.	1R1 45)46	10R11 45)461	12 54)648	30R35 64)1955	60R15 23)1395
7.	1R1 32)33	10R19 32)339	28 22)616	21R27 83)1770	71R24 52)3716
8.	1R5 53)58	11R3 53)586	13 31)403	40R10 74)2970	61 53)3233
9.	1R5 84)89	10R51 84)891	10R40 71)750	84 33)2772	90R10 41)3700
10.	1R7 40)47	11R30 40)470	13 21)273	30R41 84)2561	40R40 63)2560

Discuss ex. 1-2 carefully with pupils, following development as given on page. In ex. 3-10 have pupils explain 1's and 0's in quotient figures.

Review long division with 2-figure divisors; remainders expressed as R.

Problems and Practice

1. Jim's father bought a machine for his farm. He paid part of the cost when he got it. He still has to pay $350. If he pays $25 a month, how many months will it take him to pay $350? 14

2. The children in Jack's class collected $26.25 by selling tickets to a play. The cost of each ticket was $.35. How many tickets did the children sell? 75

▶ Change $26.25 to 2625¢ and $.35 to 35¢. Then divide.

3. It cost $18.70 to hire a bus to take 32 children and 2 teachers to the zoo. Find the cost of the trip per person. $.55

In ex. 4-11 have pupils explain placement of quotient figures.

Divide and check. If there is a remainder, write R before it:

4. 806 ÷ 31 26 1470 ÷ 35 42 2214 ÷ 82 27 2066 ÷ 71 29R7

5. 689 ÷ 65 10R39 1188 ÷ 44 27 2418 ÷ 31 78 2646 ÷ 63 42

6. 798 ÷ 21 38 1302 ÷ 42 31 4810 ÷ 74 65 2629 ÷ 61 43R6

7. 956 ÷ 43 22R10 1509 ÷ 25 60R9 2959 ÷ 72 41R7 1485 ÷ 45 33

8. 792 ÷ 24 33 1426 ÷ 23 62 3784 ÷ 44 86 1333 ÷ 31 43

9. 992 ÷ 32 31 1836 ÷ 34 54 3588 ÷ 92 39 3633 ÷ 45 80R33

10. 658 ÷ 54 12R10 1145 ÷ 55 20R45 3849 ÷ 51 75R24 1512 ÷ 24 63

11. 866 ÷ 41 21R5 1160 ÷ 95 12R20 1208 ÷ 24 50R8 2528 ÷ 63 40R8

Find the cost of each one if

12. 23 whistles cost $7.13. $.31 32 roses cost $8.00. $.25

13. 31 pictures cost $8.99. $.29 21 tickets cost $7.35. $.35

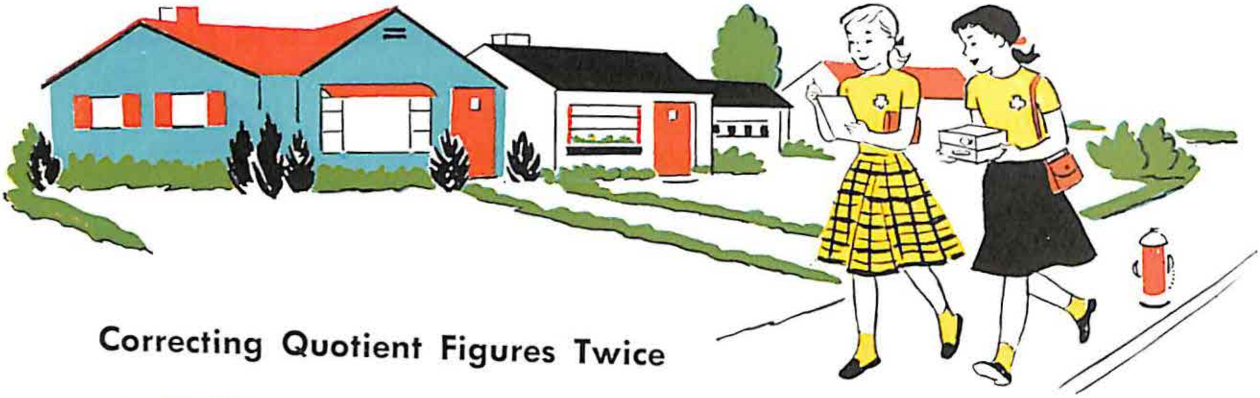
14. Betty can save $.25 a week. How many weeks will it take her to save $15.00? 60 Is that more or less than 1 yr.? More

▶ Change $15.00 to 1500¢ and $.25 to 25¢.

15. If Betty could save $.75 a week, how many weeks would it take her to save $15.00? 20

▶ Change $15.00 to 1500¢ and $.75 to 75¢.

Remind pupils to change dividend and divisor to cents and divide as usual, when dividing money numbers by money numbers (involving dollars "and" cents). Stress placement of decimal points in ex. 3, 12, 13.



Correcting Quotient Figures Twice

1. **Problem** The 25 girls in a Brownie troop sold 1400 boxes of cookies for the Girl Scouts. How many boxes, on the average, did each girl sell? 56

$$\begin{array}{r} 56\\ 25\overline{)1400}\\ \underline{125}\\ 150\\ \underline{150} \end{array}$$

Explanation Think, "14 ÷ 2 = 7." You see that 7 is too large for the first quotient figure because $7 \times 25 = 175$ and 175 cannot be subtracted from 140. Next try 6. 6 is also too large because $6 \times 25 = 150$ and 150 cannot be subtracted from 140. Then try 5. 5 is right because 125 is less than 140 and the remainder 15 is less than the divisor 25. Tell how the second quotient figure is found. The quotient is 56. Each girl sold an average of 56 boxes.

2. In another troop 24 girls sold 1872 boxes of cookies. What was the average number of boxes sold per girl in that troop? 78

Divide and check by multiplying: Stress correct placement of quotients.

3.	7R17 24)185	74 25)1850	78R7 23)1801	75 25)1875	78 24)1872
4.	7R19 23)180	66R21 25)1671	75 24)1800	78R15 23)1809	77 24)1848
5.	7R31 35)276	77R22 25)1947	78 35)2730	57R17 25)1442	77R15 25)1940
6.	7R15 25)190	68 24)1632	67 24)1608	72 25)1800	77R16 35)2711

To the Teacher. By using the methods of long division given in this book, the number of cases where it is necessary to correct the quotient figure twice, as shown above, is extremely small, being only $\frac{1}{2}$ of 1% of all possible cases. In all other cases where the quotient figure needs correction, a single correction is sufficient.

See G-41 for further discussion of number of cases where quotient figure must be corrected twice. Follow development on page, discussing ex. 1 carefully with pupils. Have them explain work in ex. 2-6.

Divide and check. Use remainders to give fractions in the quotients:

1. 865 ÷ 41 $21\frac{4}{41}$ 1390 ÷ 21 $66\frac{4}{21}$ 1178 ÷ 23 $51\frac{5}{23}$ 5207 ÷ 65 $80\frac{7}{65}$
2. 980 ÷ 35 28 1485 ÷ 55 27 2237 ÷ 42 $53\frac{11}{42}$ 3071 ÷ 42 $73\frac{5}{42}$
3. 767 ÷ 51 $15\frac{2}{51}$ 2925 ÷ 45 65 1435 ÷ 34 $42\frac{7}{34}$ 4823 ÷ 53 91
4. 975 ÷ 75 13 2958 ÷ 34 87 5771 ÷ 72 $80\frac{11}{72}$ 2867 ÷ 61 47
5. 579 ÷ 22 $26\frac{7}{22}$ 2685 ÷ 83 $32\frac{29}{83}$ 1824 ÷ 24 76 2728 ÷ 35 $77\frac{33}{35}$
6. 852 ÷ 71 12 1489 ÷ 33 $45\frac{4}{33}$ 1807 ÷ 62 $29\frac{9}{62}$ 1661 ÷ 25 $66\frac{11}{25}$
7. 700 ÷ 33 $21\frac{7}{33}$ 1431 ÷ 44 $32\frac{23}{44}$ 2912 ÷ 52 56 2400 ÷ 32 75
8. 675 ÷ 25 27 4153 ÷ 92 $45\frac{13}{92}$ 1971 ÷ 73 27 2489 ÷ 54 $46\frac{5}{54}$
9. 625 ÷ 31 $20\frac{5}{31}$ 3271 ÷ 64 $51\frac{7}{64}$ 1900 ÷ 25 76 3654 ÷ 63 58

10. In his store last month Mr. Porter sold 1825 qt. of ice cream. The store was open 25 days last month. What was the average number of quarts of ice cream sold per day? 73

11. Milk costs $.22 a quart. Last month Mrs. Case paid $9.90 for milk. How many quarts of milk did she buy? 45
▶ Change $9.90 to 990¢ and $.22 to 22¢.

12. A fast train averages 62 mi. per hour. How many hours will it take to make a trip of 744 mi.? 12

13. Today Miss March sold 24 yd. of cotton cloth with a value of $19.92. Find the price of the cloth per yard. $.83

Divide each number by 30;(1) by 23;(2) by 35.(3) Use any remainder to give a fraction in the quotient:

(1),(2) $16\frac{11}{30}, 21\frac{8}{23}$ $23\frac{23}{30}, 31$ $54\frac{7}{30}, 70\frac{17}{23}$ $47\frac{7}{30}, 61\frac{14}{23}$ $43\frac{7}{30}, 56\frac{9}{23}$ $65\frac{13}{30}, 85\frac{8}{23}$
(3) **14.** 491 $14\frac{1}{35}$ 713 $20\frac{13}{35}$ 1627 $46\frac{17}{35}$ 1417 $40\frac{17}{35}$ 1297 $37\frac{2}{35}$ 1963 $56\frac{3}{35}$

$5\frac{19}{30}, 7\frac{8}{23}$ $11\frac{29}{30}, 15\frac{14}{23}$ $51\frac{13}{30}, 67\frac{2}{23}$ $64\frac{23}{30}, 84\frac{11}{23}$ $43\frac{13}{30}, 56\frac{15}{23}$ $60\frac{7}{30}, 78\frac{13}{23}$
15. 169 $4\frac{29}{35}$ 359 $10\frac{9}{35}$ 1543 $44\frac{3}{35}$ 1943 $55\frac{18}{35}$ 1303 $37\frac{8}{35}$ 1807 $51\frac{22}{35}$

$16\frac{29}{30}, 22\frac{3}{23}$ $4\frac{23}{30}, 6\frac{5}{23}$ $43\frac{29}{30}, 57\frac{8}{23}$ $37\frac{19}{30}, 49\frac{2}{23}$ $36\frac{29}{30}, 48\frac{5}{23}$ $52\frac{19}{30}, 68\frac{15}{23}$
16. 509 $14\frac{19}{35}$ 143 $4\frac{3}{35}$ 1319 $37\frac{24}{35}$ 1129 $32\frac{9}{35}$ 1109 $31\frac{24}{35}$ 1579 $45\frac{4}{35}$

$5\frac{23}{30}, 7\frac{8}{23}$ $6\frac{19}{30}, 8\frac{15}{23}$ $55\frac{1}{30}, 71\frac{18}{23}$ $42\frac{1}{30}, 54\frac{19}{23}$ $61\frac{17}{30}, 80\frac{7}{23}$ $48\frac{11}{30}, 63\frac{2}{23}$
17. 173 $4\frac{33}{35}$ 199 $5\frac{24}{35}$ 1651 $47\frac{6}{35}$ 1261 $36\frac{1}{35}$ 1847 $52\frac{27}{35}$ 1451 $41\frac{16}{35}$

$26\frac{29}{30}, 35\frac{4}{23}$ $21\frac{1}{30}, 27\frac{10}{23}$ $42\frac{13}{30}, 55\frac{8}{23}$ $52\frac{1}{30}, 67\frac{20}{23}$ $44\frac{29}{30}, 58\frac{15}{23}$ $64\frac{7}{30}, 83\frac{18}{23}$
18. 809 $23\frac{4}{35}$ 631 $18\frac{1}{35}$ 1273 $36\frac{13}{35}$ 1561 $44\frac{21}{35}$ 1349 $38\frac{19}{35}$ 1927 $55\frac{2}{35}$

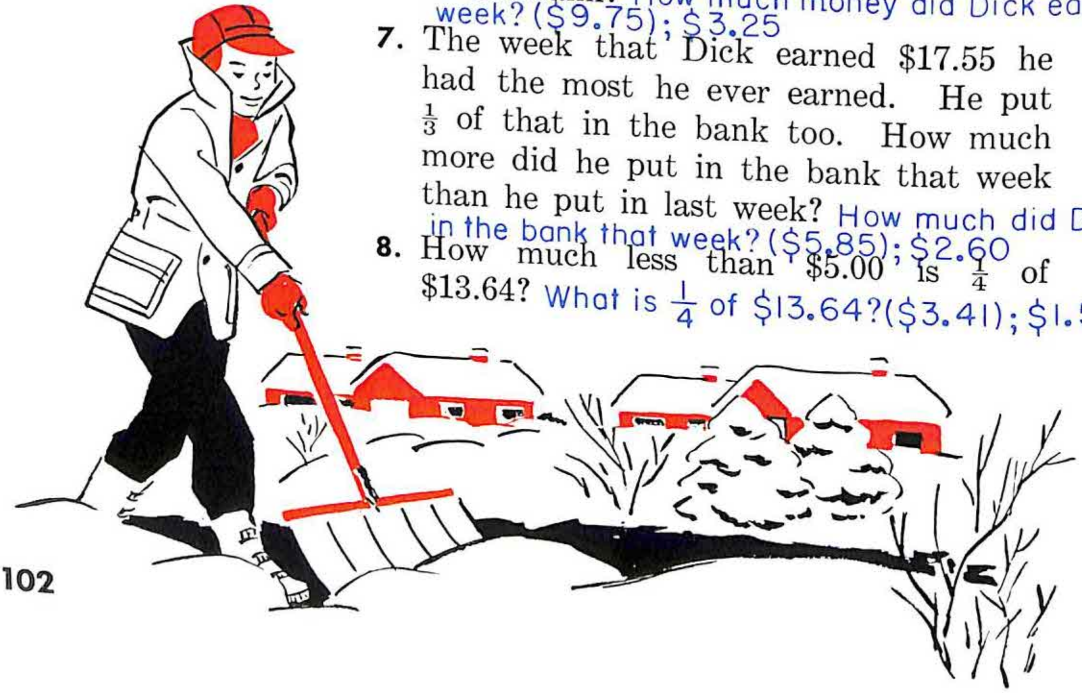
Let pupils do this work independently. Observe work habits and evidences of frustration of different pupils. Group pupils who have difficulties for further review or reteaching. Let others work at arithmetic corner.

Let pupils do problems independently. Be sure they understand that answer to hidden question must be used in finding answer to problem. Work with pupils who have difficulty in recognizing hidden questions.

Two-Step Problems

In each problem first tell what the hidden question is and answer it. Then answer the question asked in the problem:

1. Ann bought 6 boxes of candy bars with 24 bars in each box. She sold all of them at 6¢ a bar. How much money in all should Ann have received? How many candy bars did Ann have? (144); 864¢, or $8.64
2. At the store Mary and Bill bought a yellow bird for $7.75, a cage for $5.29, and bird food for $.52. They shared the cost equally. How much did each one pay? How much did Mary and Bill spend? ($13.56); $6.78
3. In November our class sold 432 Christmas cards and made $.02 on each one. We want to buy a new United States flag for $12.50. Have we enough money? If not, how much more do we need? How much did our class make on the Christmas cards? ($8.64); $3.86
4. Tom rides his bicycle at a speed of 8 mi. an hour. At that rate, how far can he ride from 8:30 A.M. until 10:30 A.M.? How many hours are there from 8:30 A.M. to 10:30 A.M.? (2 hr.); 16 mi.
5. A club buys nuts at $.75 a pound and sells them at $1.10 a pound. If they buy a 50-pound bag of nuts and sell all of them, how much do they make? How much does the club make on each pound of nuts? ($.35); $17.50
6. Dick worked 15 hr. last week and earned $.65 an hour. He put $\frac{1}{3}$ of this money in the bank. How much did Dick put in the bank? How much money did Dick earn last week? ($9.75); $3.25
7. The week that Dick earned $17.55 he had the most he ever earned. He put $\frac{1}{3}$ of that in the bank too. How much more did he put in the bank that week than he put in last week? How much did Dick put in the bank that week? ($5.85); $2.60
8. How much less than $5.00 is $\frac{1}{4}$ of $13.64? What is $\frac{1}{4}$ of $13.64? ($3.41); $1.59



Present timed tests on the four basic operations.

Testing Your Skill

You should be able to do all the exercises in each test correctly in the time allowed.

Addition Test

Add. Write the answers on folded paper: Time: 4 min.

1.	79	37	52	66	14	49	48	75
	22	32	43	46	53	89	65	16
	47	63	57	82	98	62	18	82
	61	57	32	59	87	43	57	69
	54	84	45	94	30	91	92	50
	68	35	71	24	65	48	85	56
	331	308	300	371	347	382	365	348

Subtraction Test

Subtract. Write the answers on folded paper: Time: 3 min.

2.	4968	6202	5195	3751	6000
	4236	4492	2586	1733	3438
	732	1710	2609	2018	2562
3.	9272	4000	5243	8120	3004
	7665	3756	1324	6544	1896
	1607	244	3919	1576	1108

Multiplication Test

Copy and multiply: Time: 4 min. after copying.*

4.	3127	2875	6190	8543	4069
	38	19	26	75	84
	118,826	54,625	160,940	640,725	341,796

Division Test

Copy and divide: Time: 4 min. after copying.*

	486	265R1	637	198R4
5.	8)3888	5)1326	9)5733	7)1390
	548	706	294	370R5
6.	9)4932	7)4942	6)1764	8)2965

---

* In these tests copy all the exercises on a sheet of paper, spreading them over the sheet to allow working space. See page 328.

See page 71 and G-32 for discussion of timed tests. Compare results of tests with previous ones (page 71); note improvements and/or weaknesses. Be sure pupils do not sacrifice accuracy for speed. Drill or reteach as needed.

11's and 12's in Multiplication

1. Here are the multiplication facts for the 11's. You see they are easy to learn. Cover the answers and try to give them:

11	11	11	11	11	11	11	11	11
1	2	3	4	5	6	7	8	9
11	22	33	44	55	66	77	88	99

2. There are 11 players on a football team. How many players are there when 4 teams are on the practice field? 44

3. Mary rides 11 mi. on a school bus every school day. How many miles does she ride in a week of 5 school days? 55

4. Jim lives 11 blocks from school. He walks that distance twice each school day. How many blocks does he walk to and from school each day? 22

5. Learn to count by 11's. Start like this: 11, 22, 33, 44, 55, 66, 77, 88, 99, 110

6. The 12's facts are very useful. Several units of measure use 12 in changing from one unit to another. For example, 12 in. equal 1 ft., so there are 3 × 12 in. in 3 ft. Can you give other examples of 12 in measures? You see it would save time if you knew the multiplication facts for the 12's.

7. Learn these facts:

12	12	12	12	12	12	12	12	12
1	2	3	4	5	6	7	8	9
12	24	36	48	60	72	84	96	108

8. Bill sold 6 doz. eggs. How many eggs are there in 6 doz.? 72

9. Ann is trying to put $5 a month in the bank. How much will she put in the bank in 1 yr.? $60

10. How many numbers are there on a clock face? 12 How long does it take the minute hand on the clock to go from 1 to 2? 5 min. from 2 to 3? 5 min. How long does it take the minute hand to go all around the clock face? 60 min.

11. Study the 12's facts. Then count by 12's to 120. 12, 24, 36, 48, 60, 72, 84, 96, 108, 120

Emphasize convenience of knowing facts for 11's and 12's in doing long division. Also, stress reasons for memorizing 12's facts (as given in ex. 6, 8, 9, 10). Reinforce learning of facts by relating to 10 (3 × 10 = 30, 3 × 1 = 3, 30 + 3 = 33).

Before doing this page, conduct drill on facts for 11's and 12's. See "Wheel of Chance" on G-112.

Dividing by 11 and 12

Think of the multiplication facts for 11 and 12 and give the answers:

1. 48 ÷ 12 4   66 ÷ 11 6   72 ÷ 12 6   36 ÷ 12 3

2. 24 ÷ 12 2   55 ÷ 11 5   96 ÷ 12 8   12 ÷ 12 1

3. 60 ÷ 12 5   99 ÷ 11 9   108 ÷ 12 9   84 ÷ 12 7

4. **Problem** Mr. White saved $864 last year. What was the average amount he saved per month? $72

Explanation You need to divide 864 by 12 because there are 12 mo. in 1 yr. Think, "How many 12's are there in 86?" You know the 12's facts in multiplication, so you see there are seven 12's in 86. Write 7 in the quotient over 6. Think, "7 × 12 = 84." Write 84 under 86 and subtract. The remainder is 2. Since 2 is less than the divisor 12, 7 is the correct quotient figure. Tell how to finish the work. What was the average amount Mr. White saved per month? $72

```
   72
12)864
   84
    24
    24
```

5. Jean bought 11 yd. of ribbon and paid $3.19 for it. What was the price of the ribbon per yard? $.29

6. One month Bill got 380 eggs from his hens. He sold all but 8 eggs by the dozen. How many dozens did he sell? 31

Divide these numbers by 11:

7. 583 53   836 76   715 65   946 86   550 50   253 23

8. 803 73   497 45R2   620 56R4   242 22   379 34R5   889 80R9

9. 200 18R2   815 74R1   576 52R4   924 84   268 24R4   352 32

Divide these numbers by 12:

10. 996 83   852 71   408 34   540 45   348 29   965 80R5

11. 655 54R7   336 28   779 64R11   905 75R5   636 53   372 31

12. 607 50R7   425 35R5   156 13   684 57   565 47R1   809 67R5

13. 396 33   984 82   576 48   672 56   444 37   876 73

After drill do ex. 1-3 orally. Have pupils give corresponding multiplication facts. In ex. 7-13 have pupils tell which multiplication facts helped them in finding quotient figures.

See G-43 for correlation of examples with aims.

Chapter Review

1. Ann's father drove his car 5 hr. to make a trip of 210 mi. What was his average speed in miles per hour? 42
2. Jack bought 2 bu. of apples. He sold them by the quart at $.12 a quart. How much did he get for the apples? $7.68
3. At the store Susan spent $1.75 for handkerchiefs and $1.69 for stockings. How much change did she get from $5.00? $1.56
4. The cooking class made 360 cookies one day. How many dozen cookies were there? 30
5. How many pecks are there in $\frac{1}{2}$ bu.? 2 in $\frac{1}{4}$ bu.? 1
6. How many years are 84 mo.? 7 108 mo.? 9 180 mo.? 15
7. How many dozen eggs are 348 eggs? 29 192 eggs? 16

Write only the answers:

8.	6 × 11 66	7 × 12 84	44 ÷ 11 4	96 ÷ 12 8
9.	4 × 12 48	5 × 11 55	36 ÷ 12 3	72 ÷ 12 6
10.	9 × 11 99	5 × 12 60	60 ÷ 12 5	22 ÷ 11 2
11.	8 × 12 96	9 × 12 108	77 ÷ 11 7	24 ÷ 12 2
12.	6 × 12 72	8 × 11 88	84 ÷ 12 7	33 ÷ 11 3

Divide and check. Write R before each remainder:

13.	960 ÷ 20 48	4377 ÷ 95 46R7	1375 ÷ 55 25	4910 ÷ 74 66R26
14.	736 ÷ 32 23	1433 ÷ 62 23R7	1068 ÷ 12 89	1386 ÷ 22 63
15.	529 ÷ 23 23	1032 ÷ 24 43	1771 ÷ 23 77	1364 ÷ 31 44
16.	644 ÷ 23 28	2160 ÷ 43 50R10	1350 ÷ 25 54	1841 ÷ 32 57R17
17.	194 ÷ 25 7R19	2737 ÷ 65 42R7	1196 ÷ 12 99R8	3203 ÷ 63 50R53
18.	814 ÷ 11 74	2930 ÷ 53 55R15	2079 ÷ 34 61R5	3612 ÷ 42 86
19.	793 ÷ 61 13	2237 ÷ 72 31R5	1807 ÷ 23 78R13	1800 ÷ 24 75
20.	270 ÷ 34 7R32	3397 ÷ 43 79	2442 ÷ 74 33	1175 ÷ 25 47

Note results on progress cards and plan for remedial work based on individual or class needs. Help pupils who had errors to determine causes, such as, basic facts, vocabulary, processes, and so on.

A Problem Test

1. At an average speed of 328 mi. per hour, how many miles can an airplane go in 3 hr.? 984

2. Jim bought 3 ties at $.59 apiece. How much change did he get from $2.00? $.23

3. It takes 6 yd. of cloth for a clown suit. At $.55 a yard, find the cost of the cloth for 12 clown suits. $39.60

4. Bill's father drives his car at an average speed of 42 mi. an hour. How far can he drive from 8 A.M. to 1 P.M.? 210 mi.

5. At the lunchroom in the Parker School, 1870 sandwiches were sold in 22 da. last month. What was the average number of sandwiches sold per day? 85

6. Ann can walk at a speed of 3 mi. per hour. How long should it take her to walk 4 mi.? $\frac{4}{3}$ hr., or $1\frac{1}{3}$ hr.

7. Jack is 56 in. tall. His father is 6 ft. 2 in. tall. How much taller is Jack's father than Jack? 18 in.

8. It costs $21.50 a week to stay at camp. Mary wants to stay 3 wk. and also have $15.00 to spend while she is at camp. How much money does Mary need all together? $79.50

9. Mary has saved $51.02 so far. There are 32 wk. before she goes to camp. How much, on the average, does she need to save each week for 32 wk.? $.89 See ex. 8.

10. Last week Andy read the temperature every school day at 8 A.M. These were the five temperatures he read: 53°, 46°, 45°, 42°, 49°. What was the average temperature on Andy's thermometer for those five days? 47°

How many problems did you get right? What does your score mean? Did you do better than you did on the last test?

SCORE	0–5	6–7	8–9	10
	You need help	Fair	Good	Excellent

Have pupils record their scores on own charts, and compare with previous ones. Group pupils who had difficulties and discuss problems with them. Suggest that they restate problem in own words and then solve it.

Present diagnostic test of skills taught.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Pages for that row.

Multiply these numbers and check:

					Practice Pages
1.	4257 26 110,682	1076 85 91,460	2839 47 133,433	3540 93 329,220	50
2.	842 716 602,872	527 492 259,284	951 835 794,085	736 379 278,944	66, 67
3.	351 205 71,955	906 109 98,754	274 370 101,380	285 640 182,400	69

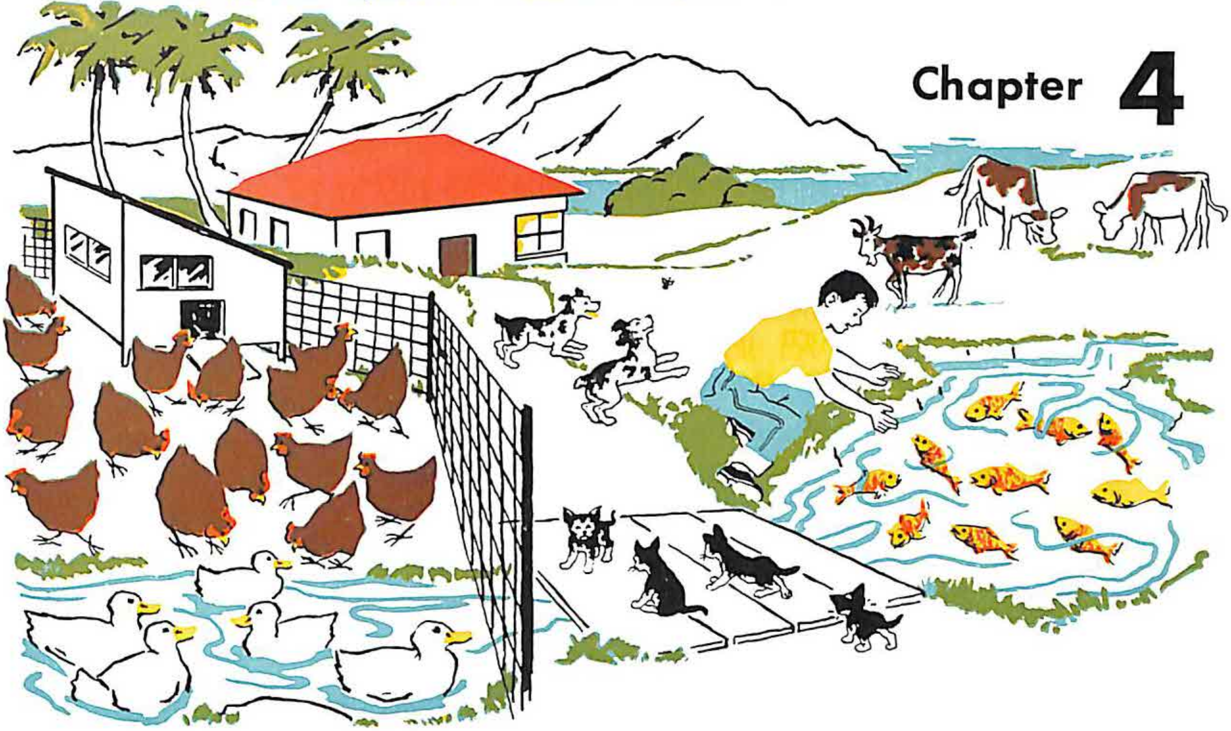
Divide and check. Write R before each remainder:

4.	3 30)90	1R19 60)79	4 20)80	2R12 40)92	79
5.	9 50)450	8R7 30)247	7R11 40)291	9R13 20)193	80
6.	9R8 42)386	6 31)186	4 65)260	6 23)138	81
7.	42 21)882	43 45)1935	32R5 43)1381	53 22)1166	84–86
8.	$ .22 42)$9.24	$ .25 22)$5.50	$ .64R3¢ 83)$53.15	$ .37 54)$19.98	90
9.	7R9 23)170	7 35)245	3R34 42)160	7R41 64)489	94
10.	19R2 42)800	48 53)2544	37R26 32)1210	59R11 71)4200	95
11.	1R4 63)67	10R29 42)449	60R5 23)1385	81 51)4131	98
12.	77R21 25)1946	77R25 35)2720	75R22 24)1822	64 25)1600	100
13.	43 11)473	57R8 11)635	68 11)748	79 11)869	105
14.	69 12)828	82 12)984	67 12)804	45R7 12)547	105

Compare results of test with previous ones as noted on progress cards. Urge pupils who had mistakes to make self-assignments from practice pages (give help as needed). Let others work on magic squares.

See G-44 for specific aims of Chapter 4.

Chapter 4



Lua's Pets

Present mixed problems dealing with care of pets.

1. Lua lives on a farm in Hawaii and keeps many pets. He has 1 goat, 2 calves, 5 ducks, 2 dogs, 4 kittens, 15 hens, and 10 little fish. How many pets in all has Lua? 39

2. Lua bought the fish with money he received for his birthday. He bought 9 fish at $.35 each and 1 fish at $.59. How much did Lua pay for the fish? $ 3.74

3. Lua got $7.50 for his birthday. How much did he have left after he bought the fish? $ 3.76

4. Lua sells the eggs he gets from his hens. Last month he got 283 eggs in all. How many dozen eggs was that? 23 Were there any eggs left over? 7

5. Lua sold 22 doz. eggs last month and got $.62 a dozen for them. How much did Lua get for the eggs? $ 13.64

6. Lua buys feed for his hens. Last month he paid $6.25 for feed. How much egg money did he have left after paying for the feed? $ 7.39 See ex. 5.

Motivate lesson through discussion of pupils' own pets. Then have pupils do ex. 1–6. Urge them to make up other problems, for class to solve, based on own experiences with pets or farm animals.

Provide rapid review of basic skills.

Problems and Practice

1. How many dozen eggs are 144 eggs? 12 192 eggs? 16
2. How many days are 48 hr.? 2 120 hr.? 5 168 hr.? 7
3. Mr. King sold 1110 gal. of milk in 30 da. How many gallons of milk, on the average, did he sell per day? 37
4. George was born in 1948 and Betty was born in 1952. How much older is George than Betty? 4 yr.
5. Ann bought $\frac{3}{4}$ lb. of nuts at $1.20 a pound. How much change did she get from $1.00? $.10
6. Last week on 5 days 1185 children ate lunch in the school lunchroom. What was the average number of children per day who ate lunch there? 237
7. Jack bought 500 greeting cards for $11.50. He sold them all at 5¢ each. How much money did Jack make by selling these cards? $ 13.50

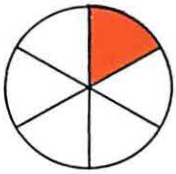
Copy and find the answers. Watch the signs:

8. 67 × 94 6298 775 ÷ 25 31 8 + 9 + 6 23
9. 58 + 74 132 206 − 58 148 4 + 7 + 9 20
10. $\frac{1}{2}$ of 106 53 495 + 87 582 9 + 5 + 6 20
11. 837 ÷ 9 93 70 × 506 35,420 34 × 4928 167,552
12. 8 × 1490 11,920 1400 − 87 1313 8000 − 172 7828
13. 3 + 8 + 7 18 1600 ÷ 25 64 483 × 507 244,881
14. $\frac{1}{8}$ of 784 98 4003 − 346 3657 620 × 873 541,260
15. 105 − 92 13 3796 + 609 4405 2060 − 283 1777
16. 96 + 28 124 5000 − 1695 3305 27 + 45 + 19 91
17. 50 × 82 4100 19 × 5978 113,582 93 + 86 + 54 233
18. $\frac{1}{3}$ of 864 288 2746 ÷ 33 83 R7 28 + 43 + 76 147

Urge pupils to estimate answers (mentally) before doing computations as check on reasonableness of calculated answers. Also, urge them to do some examples by mental arithmetic: ex. 8, parts 2, 3; ex. 9-10; ex. 11, part 1, and so on.

Introduce new words and meanings for fractions. See G-45 for discussion of modern teaching of fractions. Add new words to vocabulary chart.

Studying Fractions



1. This circle is divided into 6 equal parts. One part is colored red. What part of the circle is red? $\frac{1}{6}$ What part of the circle is white? $\frac{5}{6}$ Write the fraction that shows what part of the circle is white. $\frac{5}{6}$

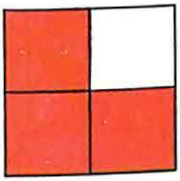
2. In the fraction $\frac{5}{6}$, 5 is called the **numerator.** It shows how many of the equal parts of the circle are white. 6 is called the **denominator.** It shows the number of equal parts in the whole circle. The numerator and denominator are the **terms** of the fraction. Bring out fact that $\frac{5}{6}$ means you have 5 of 6 equal parts. Note this in ex. 3-4 also.

Tell what each numerator and each denominator mean:

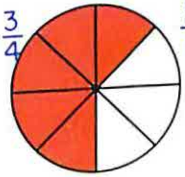
3. $\frac{1}{2}$ of a yard $\frac{1}{2}$ of a foot $\frac{5}{8}$ of a pound

4. $\frac{7}{8}$ of a yard $\frac{2}{3}$ of a foot $\frac{3}{4}$ of an hour

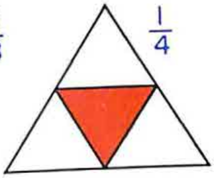
5. Write the fraction that shows the red part of each figure shown below:



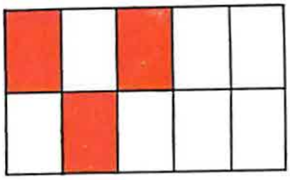
$\frac{3}{4}$



$\frac{5}{8}$



$\frac{1}{4}$



$\frac{3}{10}$

6. Write the fraction that shows the white part of each figure in ex. 5. $\frac{1}{4}$, $\frac{3}{8}$, $\frac{3}{4}$, $\frac{7}{10}$

7. Draw a square 2 in. on each side. Divide it into 16 equal parts. First draw a figure like the first one in ex. 5. Then divide each small square into 4 equal parts. How many equal parts are there in the large square? Make $\frac{3}{16}$ of the large square red. Make $\frac{7}{16}$ of it blue. 16 What part of the large square is still white? $\frac{6}{16}$

8. In these fractions, tell which number is the numerator and which number is the denominator: $\frac{5}{8}$, $\frac{1}{3}$, $\frac{4}{5}$, $\frac{9}{10}$, $\frac{11}{16}$, $\frac{15}{16}$.

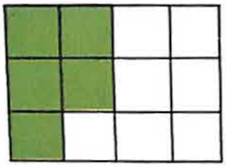
Numerators: 5, 1, 4, 9, 11, 15; denominators: 8, 3, 5, 10, 16, 16

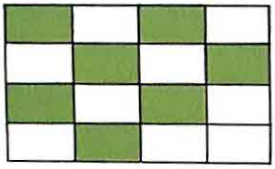
9. Write the fraction whose denominator is 12 and whose numerator is 7. $\frac{7}{12}$

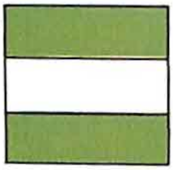
Be sure pupils understand and are able to use new words. Emphasize that numerator tells number of parts being considered, denominator tells number of equal parts in the whole and gives name of the fraction.

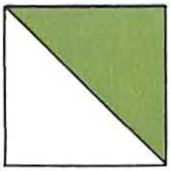
Meaning of Fractions

Teach addition of like fractions where sums are less than or equal to 1 and cannot be changed (pages 112–113). Have pupils make fractional kits (whole circles, squares, oblongs, and halves, thirds, fourths, sixths, eighths).

A


B


C


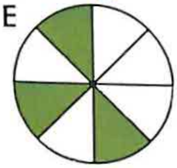
D


1. Look at the figures above. Tell how many equal parts there are in each figure. A, 12; B, 16; C, 3; D, 2

2. What part of each figure is green? What part of each figure is white? Write the fractions that you just gave for your answers. Green: A, $\frac{5}{12}$; B, $\frac{7}{16}$; C, $\frac{2}{3}$; D, $\frac{1}{2}$. White: A, $\frac{7}{12}$; B, $\frac{9}{16}$; C, $\frac{1}{3}$; D, $\frac{1}{2}$

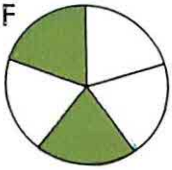
3. In each fraction you wrote in ex. 2, tell which number is the numerator and which is the denominator. Then tell what each numerator means. Tell what each denominator means.

Green $\frac{3}{8}$

E


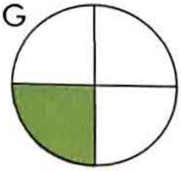
White $\frac{5}{8}$

$\frac{2}{5}$

F


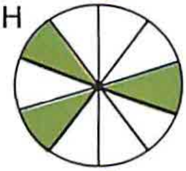
$\frac{3}{5}$

$\frac{1}{4}$

G


$\frac{3}{4}$

$\frac{3}{10}$

H


$\frac{7}{10}$

4. Look at the 4 figures above and tell what part of each figure is green. Then tell what part of each one is white. Write all the fractions you just gave for your answers.

5. In circle E above ex. 4, how many eighths are green? 3 How many eighths are white? 5 This shows that $\frac{3}{8}$ and $\frac{5}{8}$ make the whole circle. You can write it like this: $\frac{3}{8} + \frac{5}{8} = \frac{8}{8}$ or 1.

Look at figures A to H above and tell which figure shows each of the following. For example, the answer to ex. 6 is C:

6. $\frac{2}{3} + \frac{1}{3} = \frac{3}{3}$ or 1 C

7. $\frac{2}{5} + \frac{3}{5} = \frac{5}{5}$ or 1 F

8. $\frac{1}{2} + \frac{1}{2} = \frac{2}{2}$ or 1 D

9. $\frac{7}{16} + \frac{9}{16} = \frac{16}{16}$ or 1 B

10. $\frac{3}{10} + \frac{7}{10} = \frac{10}{10}$ or 1 H

11. $\frac{5}{12} + \frac{7}{12} = \frac{12}{12}$ or 1 A

First use flannelboard and fractional parts to reinforce meaning of numerator and denominator, demonstrating with halves, thirds, fourths, sixths, eighths. Let pupils use fractional kits to discover sums informally.

Adding Fractions

1. The denominator of $\frac{7}{8}$ tells us that 1 whole thing has been divided into 8 equal parts or into **eighths.** So the fraction $\frac{7}{8}$ has the name **eighths.** You can write $\frac{7}{8}$ as 7 **eighths.** You can also write $\frac{5}{6}$ as 5 **sixths.** Tell the name of each of these fractions: $\frac{2}{3}$, $\frac{4}{5}$, $\frac{7}{10}$, $\frac{9}{16}$. 2 thirds, 4 fifths, 7 tenths, 9 sixteenths

2. You know that you can add things only if they are of the **same** kind or the **same** name. You can add 4 stars and 5 stars; the answer is 9 stars. But you cannot add 4 stars and 5 bells; the answer cannot be 9 stars or 9 bells.

3. You can add fractions only if they have the **same** name. For example, you can add $\frac{2}{5}$ and $\frac{1}{5}$ because they both have the name **fifths.** When you add 2 **fifths** and 1 **fifth,** the sum is 3 **fifths.** You get the answer just as you do when you add 2 **apples** and 1 **apple.**

Write this:	Think this:
$\frac{2}{5}$	2 fifths
$\frac{1}{5}$	1 fifth
$\frac{3}{5}$	3 fifths

4. In ex. 3 you found that $\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$. The fractions $\frac{2}{5}$ and $\frac{1}{5}$ have the **same name** or the **same denominator.** To add these fractions you added the numerators, 2 and 1.

Add these fractions: Have pupils make drawings to prove answers.

5. $\begin{array}{r}\frac{3}{5}\\ \frac{1}{5}\\ \hline \frac{4}{5}\end{array}$ $\begin{array}{r}\frac{1}{3}\\ \frac{1}{3}\\ \hline \frac{2}{3}\end{array}$ $\begin{array}{r}\frac{1}{4}\\ \frac{2}{4}\\ \hline \frac{3}{4}\end{array}$ $\begin{array}{r}\frac{1}{5}\\ \frac{1}{5}\\ \hline \frac{2}{5}\end{array}$ $\begin{array}{r}\frac{2}{6}\\ \frac{3}{6}\\ \hline \frac{5}{6}\end{array}$ $\begin{array}{r}\frac{4}{10}\\ \frac{5}{10}\\ \hline \frac{9}{10}\end{array}$ $\begin{array}{r}\frac{7}{16}\\ \frac{2}{16}\\ \hline \frac{9}{16}\end{array}$ $\begin{array}{r}\frac{5}{12}\\ \frac{2}{12}\\ \hline \frac{7}{12}\end{array}$

6. $\begin{array}{r}\frac{3}{8}\\ \frac{4}{8}\\ \hline \frac{7}{8}\end{array}$ $\begin{array}{r}\frac{1}{8}\\ \frac{6}{8}\\ \hline \frac{7}{8}\end{array}$ $\begin{array}{r}\frac{2}{5}\\ \frac{2}{5}\\ \hline \frac{4}{5}\end{array}$ $\begin{array}{r}\frac{4}{8}\\ \frac{1}{8}\\ \hline \frac{5}{8}\end{array}$ $\begin{array}{r}\frac{3}{7}\\ \frac{1}{7}\\ \hline \frac{4}{7}\end{array}$ $\begin{array}{r}\frac{2}{12}\\ \frac{3}{12}\\ \hline \frac{5}{12}\end{array}$ $\begin{array}{r}\frac{3}{10}\\ \frac{4}{10}\\ \hline \frac{7}{10}\end{array}$ $\begin{array}{r}\frac{4}{16}\\ \frac{5}{16}\\ \hline \frac{9}{16}\end{array}$

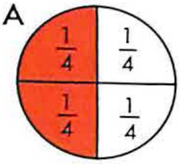
Demonstrate and stress. →

To add fractions having the same denominator, add the numerators and place this sum over the denominator.

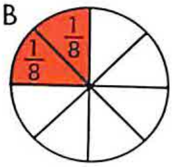
Emphasize that only things having same name can be added (ex. 2). Stress that denominator gives name of fraction, hence only those having same denominator (name) can be added (ex. 3-4).

Equal Fractions

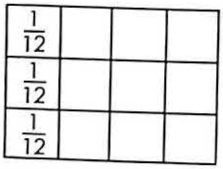
A



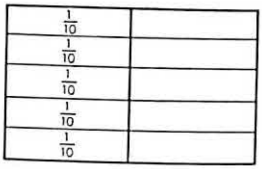
B



C



D



1. Circle A is divided into **fourths.** The red part is $\frac{1}{2}$ of circle A. How many fourths are red? 2 How many fourths of the circle equal $\frac{1}{2}$ of the circle? 2 Does $\frac{2}{4} = \frac{1}{2}$? Yes

2. Circle B is divided into **eighths.** How many eighths are red? 2 Is $\frac{1}{4}$ of the circle red? Yes How many eighths of the circle make $\frac{1}{4}$ of the circle? 2 Does $\frac{2}{8} = \frac{1}{4}$? Yes Does $\frac{1}{4} = \frac{2}{8}$? Yes

3. In circle B, how many eighths are white? 6 How many fourths are white? 3 Does $\frac{6}{8} = \frac{3}{4}$? Yes Does $\frac{3}{4} = \frac{6}{8}$? Yes

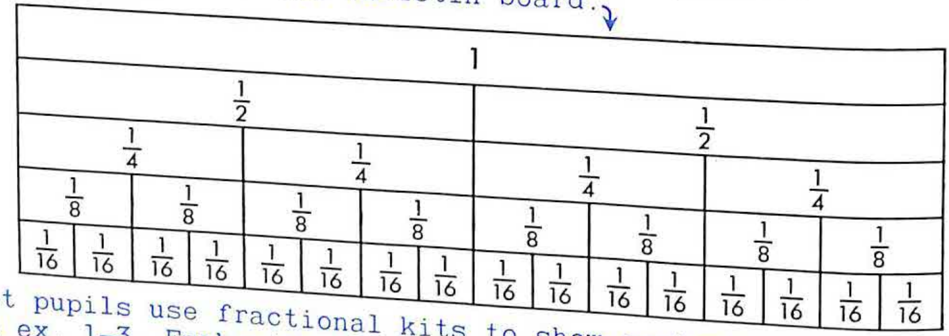
4. Study rectangles C and D. Then tell which of the following are right (R) and which are wrong (W):

$\frac{3}{12} = \frac{1}{4}$ R $\frac{10}{12} = \frac{5}{6}$ R $\frac{1}{6} = \frac{2}{12}$ R $\frac{2}{3} = \frac{8}{12}$ R $\frac{9}{10} = \frac{3}{5}$ W $\frac{4}{10} = \frac{2}{5}$ R

$\frac{5}{12} = \frac{1}{2}$ W $\frac{4}{12} = \frac{1}{3}$ R $\frac{1}{5} = \frac{2}{10}$ R $\frac{3}{4} = \frac{10}{12}$ W $\frac{8}{10} = \frac{4}{5}$ R $\frac{5}{10} = \frac{1}{2}$ R

5. Look at the diagram below. You can use it to find equal fractions. There are 5 long bars that are all the same size. The top bar is marked 1, which means it is a whole bar. The second bar is divided into 2 equal parts. The third bar is divided into 4 equal parts. From the second and third bars you see that $\frac{1}{2} = \frac{2}{4}$. Study the other bars too. Then write as many pairs of equal fractions as you can.

Make similar chart for bulletin board.



Let pupils use fractional kits to show equivalent fractions in ex. 1-3. Emphasize that $\frac{2}{4} = \frac{1}{2}$ means that $\frac{2}{4}$ has same value as $\frac{1}{2}$, but there are more parts in $\frac{2}{4}$. Follow similar procedure for halves, thirds, and sixths.

Review meaning of word "terms" (numerator and denominator) first. Compare terms in each set of fractions in ex. 1, asking which has higher terms ($\frac{8}{16}$ or $\frac{4}{8}$, $\frac{4}{8}$ or $\frac{2}{4}$, $\frac{2}{4}$ or $\frac{1}{2}$).

Changing Fractions

1. The diagram at the bottom of page 114 shows that $\frac{8}{16} = \frac{4}{8}$, $\frac{4}{8} = \frac{2}{4}$, and $\frac{2}{4} = \frac{1}{2}$. An easy way to show that $\frac{8}{16} = \frac{4}{8}$ is to divide both terms of $\frac{8}{16}$ by 2, as shown in A:

A. $\frac{8 \div 2}{16 \div 2} = \frac{4}{8}$ B. $\frac{4 \div 2}{8 \div 2} = \frac{2}{4}$ C. $\frac{2 \div 2}{4 \div 2} = \frac{1}{2}$

2. You can change $\frac{4}{8}$ to $\frac{2}{4}$ by dividing both terms by 2, as shown in B. You can change $\frac{2}{4}$ to $\frac{1}{2}$ by dividing both terms by 2, as shown in C.

3. What fraction do you get when you divide both terms of $\frac{8}{16}$ by 8? $\frac{1}{2}$ Does $\frac{8}{16} = \frac{1}{2}$? Yes

Demonstrate and emphasize.

> **If you divide both terms of a fraction by the same number, you get another fraction having the same value.**

4. When you change $\frac{12}{16}$ to $\frac{3}{4}$ by dividing both 12 and 16 by 4, you **express $\frac{12}{16}$ in lowest terms,** because you divide both 12 and 16 by the **largest** number that will divide each exactly. You could also change $\frac{12}{16}$ to $\frac{6}{8}$ by dividing both 12 and 16 by 2; in this case $\frac{12}{16}$ would not be changed to lowest terms because you could change $\frac{6}{8}$ to $\frac{3}{4}$. Fraction is in lowest terms when there is no number (except 1) by which both terms can be divided evenly.

5. Fractions are in simplest form when they are in lowest terms. How can you change $\frac{6}{12}$ to simplest form? Divide both terms by 6 to get $\frac{1}{2}$.

Change each of these fractions to lowest terms: Prove with illustrations.

6. $\frac{4}{8}$ $\frac{1}{2}$ $\frac{6}{9}$ $\frac{2}{3}$ $\frac{2}{8}$ $\frac{1}{4}$ $\frac{6}{16}$ $\frac{3}{8}$ $\frac{3}{12}$ $\frac{1}{4}$ $\frac{10}{12}$ $\frac{5}{6}$ $\frac{5}{10}$ $\frac{1}{2}$ $\frac{14}{16}$ $\frac{7}{8}$

7. $\frac{2}{4}$ $\frac{1}{2}$ $\frac{4}{6}$ $\frac{2}{3}$ $\frac{3}{6}$ $\frac{1}{2}$ $\frac{15}{20}$ $\frac{3}{4}$ $\frac{6}{12}$ $\frac{1}{2}$ $\frac{10}{16}$ $\frac{5}{8}$ $\frac{8}{12}$ $\frac{2}{3}$ $\frac{4}{10}$ $\frac{2}{5}$

8. $\frac{6}{8}$ $\frac{3}{4}$ $\frac{3}{9}$ $\frac{1}{3}$ $\frac{2}{6}$ $\frac{1}{3}$ $\frac{2}{12}$ $\frac{1}{6}$ $\frac{8}{16}$ $\frac{1}{2}$ $\frac{4}{12}$ $\frac{1}{3}$ $\frac{6}{10}$ $\frac{3}{5}$ $\frac{9}{12}$ $\frac{3}{4}$

More Practice. See ⑫ on page 314.

After review and comparison, elicit from pupils that these fractions have same value, but terms of $\frac{1}{2}$ are lowest: it has the fewest parts. Then do ex. 1-6 with pupils. Let them do ex. 7-8 independently.

Teach addition of like fractions where sums must be changed to lowest terms.

Adding Fractions

1. **Problem** Bill lives in the country. It is $\frac{1}{4}$ mi. from Bill's house to the store. How far does Bill walk when he goes to the store and back? $\frac{1}{2}$ mi.

Explanation Write the fractions in a column. The fractions have the same denominator, so add the numerators. The sum is $\frac{2}{4}$. You can change $\frac{2}{4}$ to $\frac{1}{2}$. So Bill walks $\frac{1}{2}$ mi. in all.

$$\begin{array}{c}\frac{1}{4}\\ \frac{1}{4}\\ \hline \frac{2}{4}\end{array} = \frac{1}{2}$$

2. Ann lives $\frac{3}{8}$ mi. from school. She walks to school in the morning and back home in the afternoon. How far does Ann walk to school and back? $\frac{6}{8}$ mi., or $\frac{3}{4}$ mi.

3. For doll clothes Betty needs $\frac{3}{8}$ yd. and $\frac{1}{8}$ yd. of cloth. How many yards of cloth does Betty need all together? $\frac{4}{8}$, or $\frac{1}{2}$

4. At the store Tom bought $\frac{9}{16}$ lb. of cream cheese and $\frac{5}{16}$ lb. of cottage cheese. How much did all the cheese weigh? $\frac{14}{16}$ lb., or $\frac{7}{8}$ lb.

Let pupils use drawings or fractional parts in ex. 5–7.

Add these fractions. Change answers to lowest terms:

5.	$\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{3}$	$\frac{2}{6}$ $\frac{1}{6}$ $\frac{1}{2}$	$\frac{1}{6}$ $\frac{3}{6}$ $\frac{2}{3}$	$\frac{1}{3}$ $\frac{1}{3}$ $\frac{2}{3}$	$\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{5}$	$\frac{1}{10}$ $\frac{7}{10}$ $\frac{4}{5}$	$\frac{1}{12}$ $\frac{7}{12}$ $\frac{2}{3}$	$\frac{3}{16}$ $\frac{5}{16}$ $\frac{1}{2}$
6.	$\frac{2}{5}$ $\frac{2}{5}$ $\frac{4}{5}$	$\frac{1}{8}$ $\frac{3}{8}$ $\frac{1}{2}$	$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{2}$	$\frac{1}{7}$ $\frac{3}{7}$ $\frac{4}{7}$	$\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{6}$	$\frac{5}{12}$ $\frac{1}{12}$ $\frac{1}{2}$	$\frac{3}{10}$ $\frac{1}{10}$ $\frac{2}{5}$	$\frac{7}{16}$ $\frac{7}{16}$ $\frac{7}{8}$
7.	$\frac{1}{5}$ $\frac{3}{5}$ $\frac{4}{5}$	$\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{4}$	$\frac{2}{7}$ $\frac{4}{7}$ $\frac{6}{7}$	$\frac{1}{9}$ $\frac{2}{9}$ $\frac{1}{3}$	$\frac{1}{16}$ $\frac{5}{16}$ $\frac{3}{8}$	$\frac{5}{16}$ $\frac{5}{16}$ $\frac{5}{8}$	$\frac{3}{16}$ $\frac{7}{16}$ $\frac{5}{8}$	$\frac{3}{10}$ $\frac{3}{10}$ $\frac{3}{5}$

Give the answers:

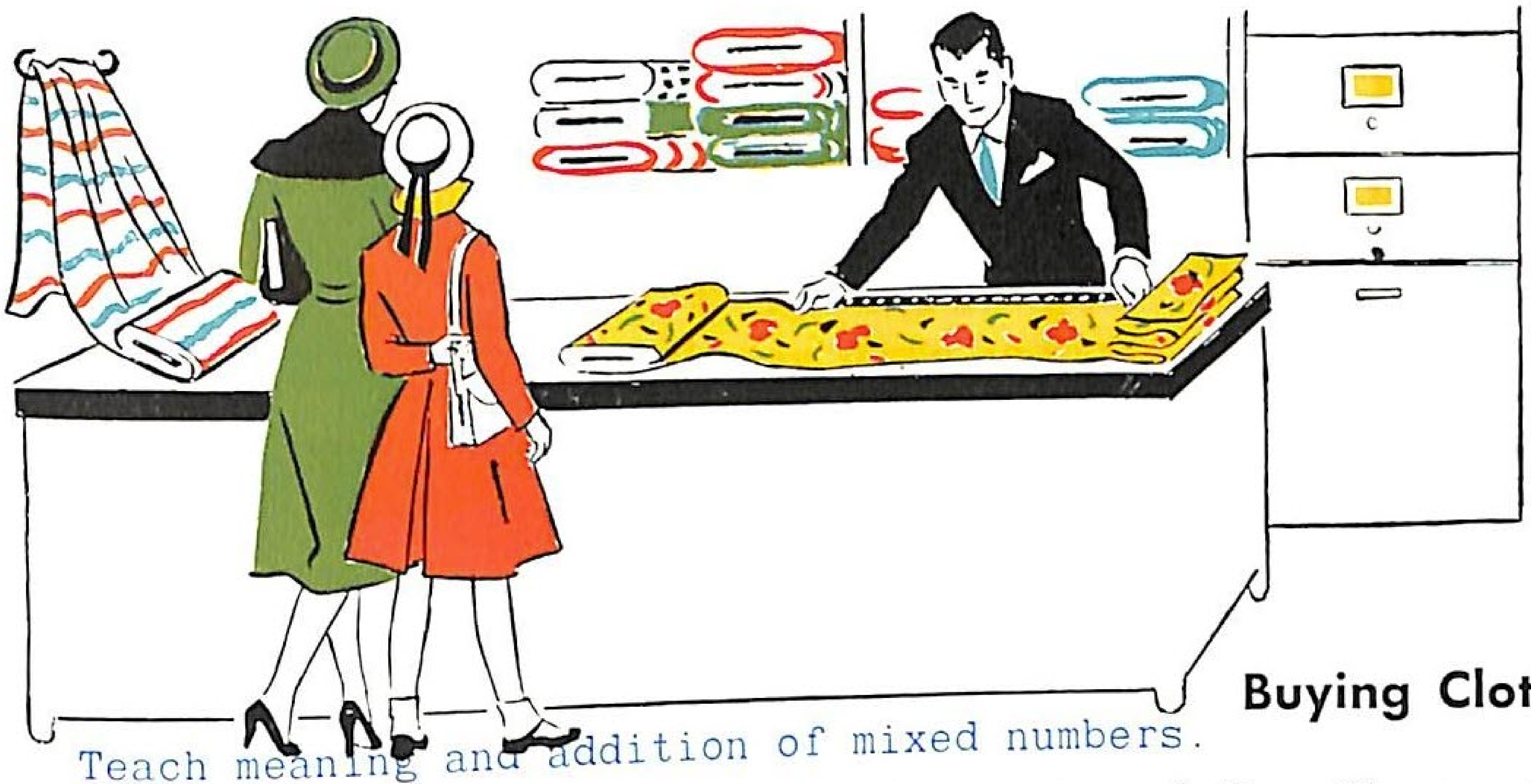
8. $\frac{1}{3} + \frac{1}{3}$ $\frac{2}{3}$ $\quad$ $\frac{1}{5} + \frac{2}{5}$ $\frac{3}{5}$ $\quad$ $\frac{2}{4} + \frac{1}{4}$ $\frac{3}{4}$ $\quad$ $\frac{3}{12} + \frac{4}{12}$ $\frac{7}{12}$

9. $\frac{1}{6} + \frac{4}{6}$ $\frac{5}{6}$ $\quad$ $\frac{3}{8} + \frac{2}{8}$ $\frac{5}{8}$ $\quad$ $\frac{1}{5} + \frac{1}{5}$ $\frac{2}{5}$ $\quad$ $\frac{5}{10} + \frac{2}{10}$ $\frac{7}{10}$

10. $\frac{3}{5} + \frac{1}{5}$ $\frac{4}{5}$ $\quad$ $\frac{2}{6} + \frac{3}{6}$ $\frac{5}{6}$ $\quad$ $\frac{3}{8} + \frac{3}{8}$ $\frac{3}{4}$ $\quad$ $\frac{1}{16} + \frac{7}{16}$ $\frac{1}{2}$

More Practice. See ⑬ on page 314. Use for individual assistance.

Remind pupils that we only add numerators of like fractions since denominator gives name of the fraction (as in 1 "apple" + 2 "apples" = 3 "apples"). Stress dividing both terms by same number to change fractions to lowest terms.



Buying Cloth

Teach meaning and addition of mixed numbers.

1. Problem Ann's mother is buying cotton cloth. She needs $3\frac{1}{4}$ yd. for Ann's dress and $1\frac{1}{4}$ yd. for an apron. How many yards of cloth does she need all together? $4\frac{1}{2}$

Explanation Write the numbers in a column. Add the two fractions. Their denominators are the same, so the sum of the fractions is $\frac{2}{4}$. Then add the other numbers, which gives 4. The sum is $4\frac{2}{4}$. Change $\frac{2}{4}$ to $\frac{1}{2}$. The answer is $4\frac{1}{2}$. Ann's mother should buy $4\frac{1}{2}$ yd. of cloth.

$$\begin{array}{r} 3\frac{1}{4} \\ \underline{1\frac{1}{4}} \\ 4\frac{2}{4} = 4\frac{1}{2} \end{array}$$

Numbers like 5, 4, and 2 are called **whole numbers.** Stress. When a fraction and a whole number are written together, as in $4\frac{1}{2}$, the number is called a **mixed number.** Stress.

2. Ann's mother bought $1\frac{3}{8}$ yd. of red wool cloth and $1\frac{3}{8}$ yd. of blue wool cloth. How many yards of wool cloth did she buy all together? $2\frac{6}{8}$, or $2\frac{3}{4}$

Add these numbers: Have pupils explain how they change fractions.

3.	$3\frac{1}{3}$ $4\frac{1}{3}$ $7\frac{2}{3}$	$2\frac{1}{8}$ $5\frac{1}{8}$ $7\frac{1}{4}$	$5\frac{3}{8}$ $3\frac{3}{8}$ $8\frac{3}{4}$	$3\frac{1}{6}$ $4\frac{1}{6}$ $7\frac{1}{3}$	$2\frac{5}{16}$ $2\frac{1}{16}$ $4\frac{3}{8}$	$1\frac{1}{10}$ $5\frac{7}{10}$ $6\frac{4}{5}$	$\frac{3}{16}$ $2\frac{3}{16}$ $2\frac{3}{8}$	$4\frac{1}{10}$ $1\frac{3}{10}$ $5\frac{2}{5}$
4.	$2\frac{1}{8}$ $\frac{3}{8}$ $2\frac{1}{2}$	$4\frac{5}{8}$ $2\frac{1}{8}$ $6\frac{3}{4}$	$2\frac{1}{6}$ $3\frac{3}{6}$ $5\frac{2}{3}$	$\frac{2}{5}$ $1\frac{1}{5}$ $1\frac{3}{5}$	$\frac{7}{16}$ $3\frac{3}{16}$ $3\frac{5}{8}$	$1\frac{3}{10}$ $1\frac{3}{10}$ $2\frac{3}{5}$	$1\frac{1}{12}$ $\frac{5}{12}$ $1\frac{1}{2}$	$3\frac{5}{16}$ $3\frac{3}{16}$ $6\frac{1}{2}$

More Practice. See ⑭ on page 315.

Instruct pupils to add fractions first, then whole numbers. Be sure that when they change fractional part to lowest terms, they include whole number in final answer.

Review the four processes and understanding of some arithmetic terms.

Keeping in Practice

1. Find the average of 79, 118, 56, 82, 104, and 95. 89

2. Find the difference between $90.00 and $58.39. $31.61

3. What is the quotient when you divide 1825 by 25? 73

4. Find the product of 375 and 615; 230,625 of 208 and 439. 91,312

Divide. Check the work by multiplying: Stress.

5. 1505 ÷ 43 35 1166 ÷ 22 53 3551 ÷ 53 67 1521 ÷ 34 44R25
6. 4589 ÷ 61 75R14 1735 ÷ 54 32R7 2805 ÷ 41 68R17 3299 ÷ 62 53R13
7. 1470 ÷ 35 42 1307 ÷ 21 62R5 2448 ÷ 72 34 1426 ÷ 31 46
8. 1386 ÷ 33 42 1807 ÷ 24 75R7 1634 ÷ 51 32R2 3209 ÷ 42 76R17

Subtract the smaller number from the larger one:

9. 7233; 4685 2548 4000; 2756 1244 6548; 6389 159
10. 5257; 7556 2299 9524; 2148 7376 8005; 4009 3996
11. 4639; 5419 780 1387; 5363 3976 4110; 1873 2237
12. 5615; 7000 1385 7344; 9000 1656 3986; 4824 838

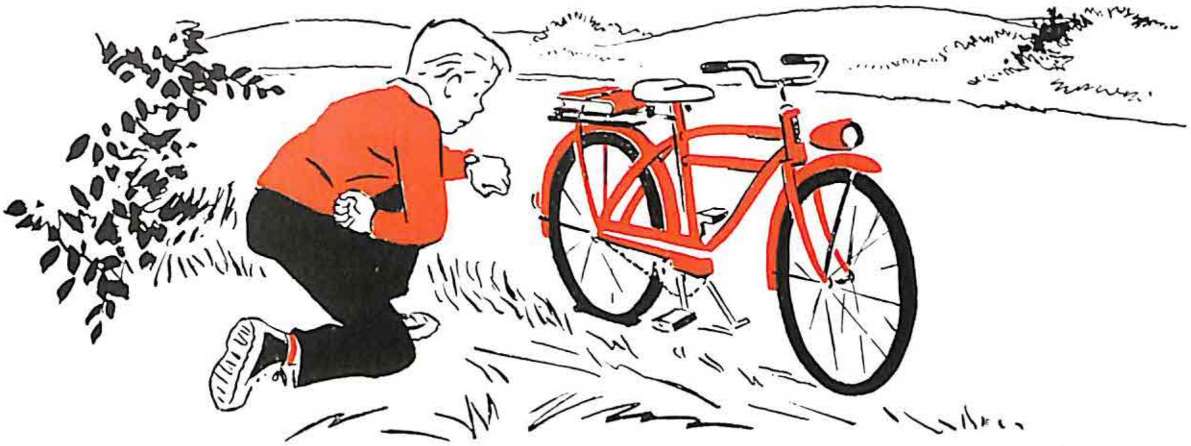
Multiply and check the work:

13. 63 × 98 6174 51 × 5280 269,280 495 × 987 488,565 208 × 198 41,184
14. 24 × 87 2088 17 × 4978 84,626 219 × 398 87,162 249 × 421 104,829
15. 56 × 43 2408 36 × 1728 62,208 407 × 635 258,445 503 × 346 174,038

Copy in columns, add, and check:

16. 417, 306, 273, 355, 475 1826 235, 489, 452, 162, 362 1700
17. 263, 255, 156, 394, 153 1221 696, 388, 445, 379, 909 2817
18. 750, 274, 613, 686, 259 2582 419, 287, 749, 157, 741 2353
19. 342, 378, 114, 889, 285 2008 379, 782, 102, 378, 691 2332

Help pupils who had errors to determine causes by having them do computations aloud. Use developmental material found on pages related to pupils' difficulties to review further as needed.



Subtracting Fractions

1. **Problem** Joe rides $\frac{3}{4}$ mi. to school on his bicycle. This morning after he had gone $\frac{1}{4}$ mi. he had a flat tire. He had no time to fix it, so he walked the rest of the way. How far did Joe have to walk? $\frac{1}{2}$ mi.

Explanation You can subtract fractions that have the same denominator just as you can add fractions that have the same denominator. Write $\frac{1}{4}$ under $\frac{3}{4}$ and subtract. The answer is $\frac{2}{4}$, which can be changed to $\frac{1}{2}$. Joe had to walk $\frac{1}{2}$ mi.

$$\begin{array}{ll} \text{3 fourths} & = \frac{3}{4} \\ \underline{\text{1 fourth}} & = \underline{\frac{1}{4}} \\ \text{2 fourths} & = \frac{2}{4} \text{ or } \frac{1}{2} \end{array}$$

2. Susan has $\frac{3}{8}$ yd. of ribbon. She needs $\frac{5}{8}$ yd. for a belt. How much too short is the piece of ribbon Susan has? $\frac{1}{4}$ yd.

3. One piece of cheese weighs $\frac{7}{8}$ lb. A smaller piece weighs $\frac{5}{8}$ lb. Find the difference in their weights. $\frac{1}{4}$ lb.

Subtract. Change fractions in answers to lowest terms: Stress.

4.	$\begin{array}{r}\frac{5}{8}\\ \underline{\frac{1}{8}}\\ \frac{1}{2}\end{array}$	$\begin{array}{r}\frac{3}{5}\\ \underline{\frac{1}{5}}\\ \frac{2}{5}\end{array}$	$\begin{array}{r}\frac{5}{6}\\ \underline{\frac{1}{6}}\\ \frac{2}{3}\end{array}$	$\begin{array}{r}\frac{7}{8}\\ \underline{\frac{2}{8}}\\ \frac{5}{8}\end{array}$	$\begin{array}{r}\frac{13}{16}\\ \underline{\frac{7}{16}}\\ \frac{3}{8}\end{array}$	$\begin{array}{r}\frac{11}{12}\\ \underline{\frac{1}{12}}\\ \frac{5}{6}\end{array}$	$\begin{array}{r}\frac{7}{10}\\ \underline{\frac{5}{10}}\\ \frac{1}{5}\end{array}$	$\begin{array}{r}\frac{15}{16}\\ \underline{\frac{5}{16}}\\ \frac{5}{8}\end{array}$	$\begin{array}{r}\frac{9}{10}\\ \underline{\frac{3}{10}}\\ \frac{3}{5}\end{array}$
5.	$\begin{array}{r}\frac{2}{3}\\ \underline{\frac{1}{3}}\\ \frac{1}{3}\end{array}$	$\begin{array}{r}\frac{7}{8}\\ \underline{\frac{1}{8}}\\ \frac{3}{4}\end{array}$	$\begin{array}{r}\frac{4}{5}\\ \underline{\frac{2}{5}}\\ \frac{2}{5}\end{array}$	$\begin{array}{r}\frac{5}{6}\\ \underline{\frac{2}{6}}\\ \frac{1}{2}\end{array}$	$\begin{array}{r}\frac{9}{10}\\ \underline{\frac{7}{10}}\\ \frac{1}{5}\end{array}$	$\begin{array}{r}\frac{7}{10}\\ \underline{\frac{1}{10}}\\ \frac{3}{5}\end{array}$	$\begin{array}{r}\frac{11}{12}\\ \underline{\frac{3}{12}}\\ \frac{2}{3}\end{array}$	$\begin{array}{r}\frac{11}{16}\\ \underline{\frac{7}{16}}\\ \frac{1}{4}\end{array}$	$\begin{array}{r}\frac{7}{12}\\ \underline{\frac{1}{12}}\\ \frac{1}{2}\end{array}$

More Practice. See ⑮ on page 315.

Use flannelboard in doing ex. 1–3. Let pupils use own fractional kits. Emphasize that fractions must have same name (denominator) before they can be subtracted.

Subtracting Mixed Numbers

1. **Problem** Last summer some boys rode their bicycles to Sunset Camp, a distance of $14\frac{7}{10}$ mi. By noon they had gone $9\frac{4}{10}$ mi. How many more miles did they have to ride? $5\frac{3}{10}$

Explanation Write the mixed numbers in a column. Stress. → Both fractions have the same denominator, so subtract the fractions. $\frac{7}{10} - \frac{4}{10} = \frac{3}{10}$. Then subtract the whole numbers. $14 - 9 = 5$. The answer is $5\frac{3}{10}$. The boys still had $5\frac{3}{10}$ mi. to ride.

$$\begin{array}{r} 14\frac{7}{10} \\ 9\frac{4}{10} \\ \hline 5\frac{3}{10} \end{array}$$

2. Study these subtraction examples:

$$\begin{array}{r} 4\frac{1}{2} \\ -2 \\ \hline 2\frac{1}{2} \end{array} \qquad \begin{array}{r} 6\frac{3}{8} \\ -2\frac{3}{8} \\ \hline 4 \end{array} \qquad \begin{array}{l} 3\frac{11}{12} \\ -1\frac{7}{12} \\ \hline 2\frac{4}{12} = 2\frac{1}{3} \end{array} \qquad \begin{array}{r} 2\frac{5}{8} \\ -\frac{5}{8} \\ \hline 2 \end{array} \qquad \begin{array}{r} 5\frac{3}{4} \\ -5\frac{1}{4} \\ \hline \frac{2}{4} = \frac{1}{2} \end{array} \qquad \begin{array}{l} 2\frac{5}{8} \\ -\frac{1}{8} \\ \hline 2\frac{4}{8} = 2\frac{1}{2} \end{array}$$

3. Cover the answers in ex. 2 with a paper and try to write the answers on the paper.

Emphasize that both terms must be divided by same number in changing fractions.

Subtract. Change fractions in answers to lowest terms:

4.
$$\begin{array}{r} 6\frac{5}{8} \\ 3\frac{1}{8} \\ \hline 3\frac{1}{2} \end{array} \quad \begin{array}{r} 7\frac{1}{2} \\ 2\frac{1}{2} \\ \hline 5 \end{array} \quad \begin{array}{r} 1\frac{5}{8} \\ \frac{3}{8} \\ \hline 1\frac{1}{4} \end{array} \quad \begin{array}{r} 2\frac{15}{16} \\ 1\frac{3}{16} \\ \hline 1\frac{3}{4} \end{array} \quad \begin{array}{r} 8\frac{7}{12} \\ 7\frac{5}{12} \\ \hline 1\frac{1}{6} \end{array} \quad \begin{array}{r} 9\frac{9}{10} \\ 7\frac{3}{10} \\ \hline 2\frac{3}{5} \end{array} \quad \begin{array}{r} 4\frac{7}{12} \\ 3\frac{1}{12} \\ \hline 1\frac{1}{2} \end{array} \quad \begin{array}{r} 6\frac{9}{16} \\ 6\frac{1}{16} \\ \hline \frac{1}{2} \end{array}$$

5.
$$\begin{array}{r} 3\frac{4}{5} \\ 2\frac{1}{5} \\ \hline 1\frac{3}{5} \end{array} \quad \begin{array}{r} 4\frac{5}{6} \\ 4\frac{1}{6} \\ \hline \frac{2}{3} \end{array} \quad \begin{array}{r} 8\frac{7}{8} \\ 2\frac{1}{8} \\ \hline 6\frac{3}{4} \end{array} \quad \begin{array}{r} 5\frac{9}{10} \\ 4\frac{7}{10} \\ \hline 1\frac{1}{5} \end{array} \quad \begin{array}{r} 9\frac{11}{12} \\ 9\frac{1}{12} \\ \hline \frac{5}{6} \end{array} \quad \begin{array}{r} 7\frac{5}{16} \\ 3\frac{1}{16} \\ \hline 4\frac{1}{4} \end{array} \quad \begin{array}{r} 8\frac{3}{10} \\ 3 \\ \hline 5\frac{3}{10} \end{array} \quad \begin{array}{r} 6\frac{11}{12} \\ \frac{5}{12} \\ \hline 6\frac{1}{2} \end{array}$$

6.
$$\begin{array}{r} 7\frac{2}{3} \\ \frac{2}{3} \\ \hline 7 \end{array} \quad \begin{array}{r} 4\frac{3}{5} \\ 2 \\ \hline 2\frac{3}{5} \end{array} \quad \begin{array}{r} 8\frac{1}{2} \\ 5\frac{1}{2} \\ \hline 3 \end{array} \quad \begin{array}{r} 6\frac{11}{16} \\ 5\frac{5}{16} \\ \hline 1\frac{3}{8} \end{array} \quad \begin{array}{r} 2\frac{7}{10} \\ \frac{7}{10} \\ \hline 2 \end{array} \quad \begin{array}{r} 7\frac{7}{16} \\ 6\frac{3}{16} \\ \hline 1\frac{1}{4} \end{array} \quad \begin{array}{r} 8\frac{5}{12} \\ 6\frac{1}{12} \\ \hline 2\frac{1}{3} \end{array} \quad \begin{array}{r} 9\frac{3}{16} \\ 5\frac{3}{16} \\ \hline 4 \end{array}$$

7.
$$\begin{array}{r} 8\frac{7}{8} \\ 8\frac{3}{8} \\ \hline \frac{1}{2} \end{array} \quad \begin{array}{r} 6\frac{7}{8} \\ 4 \\ \hline 2\frac{7}{8} \end{array} \quad \begin{array}{r} 3\frac{2}{3} \\ \frac{1}{3} \\ \hline 3\frac{1}{3} \end{array} \quad \begin{array}{r} 4\frac{9}{10} \\ 1\frac{1}{10} \\ \hline 3\frac{4}{5} \end{array} \quad \begin{array}{r} 9\frac{9}{16} \\ 3\frac{7}{16} \\ \hline 6\frac{1}{8} \end{array} \quad \begin{array}{r} 3\frac{7}{10} \\ 1\frac{3}{10} \\ \hline 2\frac{2}{5} \end{array} \quad \begin{array}{r} 5\frac{11}{12} \\ 5\frac{7}{12} \\ \hline \frac{1}{3} \end{array} \quad \begin{array}{r} 6\frac{7}{12} \\ 2\frac{7}{12} \\ \hline 4 \end{array}$$

8. Mrs. Chase had $5\frac{7}{8}$ yd. of cloth. She used $2\frac{3}{8}$ yd. for a dress for Jane. How many yards of cloth were left? $3\frac{1}{2}$

As in addition of mixed numbers, tell pupils to subtract the fractions first, then whole numbers. Be sure they give complete answer, including whole number, after changing fractions.

Present problems involving money, vocabulary, fractions.

Mixed Problems

1. Our 5 school busses carried these numbers of children to school this morning: 41, 46, 45, 44, 39. Find the average number of children per bus. 43

2. Jean's winter coat cost $19.95 at a sale. Before the sale the coat was marked $25.00. How much did Jean's mother save by buying Jean's coat at a sale? $5.05

3. Bill took in $29.40 selling tickets at 35¢ each. How many tickets did Bill sell? 84 First change $29.40 to cents.

4. Mr. Ball bought a box of 216 oranges. He sold all but 7 of them at $.05 each. How much money did he get? $10.45

5. George sold 4 bu. of apples by the quart. How many quarts of apples did he sell? George got $.12 a quart for the apples. How much did he get for all of them? $15.36

6. On 5 days Mary practiced these numbers of minutes: 45, 40, 55, 45, 55. How many hours did Mary practice? 4

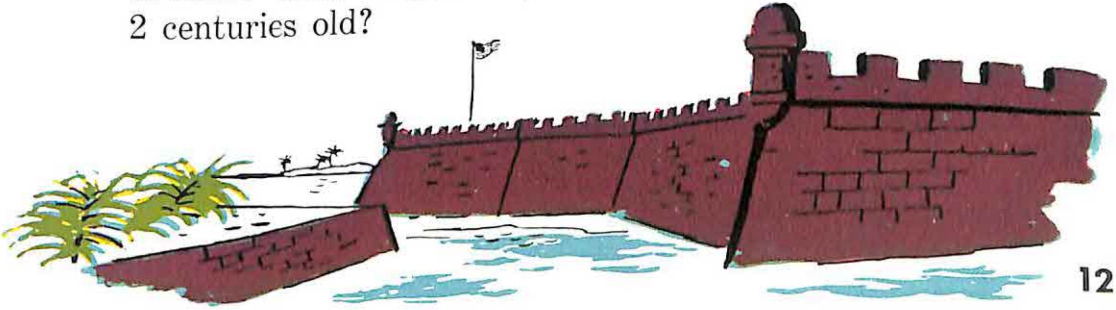
7. Grandmother lived in the same house from 1892 until 1956. How many years is that? She said, "I lived in that house . . 3 . score and . . 4 . years."

8. Andy opened his bank and found 8 quarters, 12 dimes, 17 nickels, and 38 pennies. How much money did Andy have all together? $4.43

9. At the school store Jane spent $.25, $1.15, $.08, $.50, and $.79. How much did Jane spend all together? $2.77

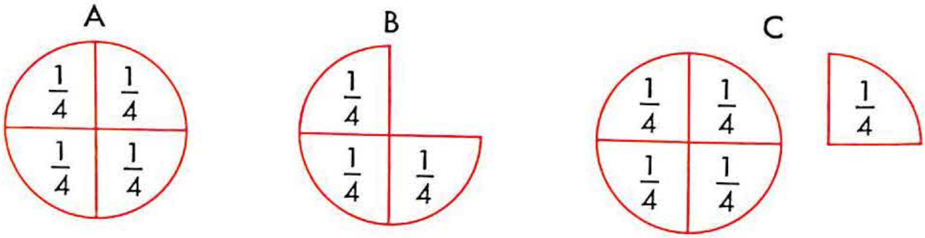
10. Mrs. West had $6\frac{7}{8}$ yd. of cloth. She used $3\frac{5}{8}$ yd. of it for a dress. How many yards of cloth did she have left? $3\frac{1}{4}$

11. On a vacation trip Jack visited an old fort that was built in 1755. How long ago was that fort built? Is it more than 2 centuries old?



Teach meaning of improper fractions and how to change them to whole or mixed numbers (page 123).

Kinds of Fractions



$\frac{4}{4}$ equals 1 $\frac{3}{4}$ is less than 1 $\frac{5}{4}$ is more than 1

1. At A above you see a whole circle. A whole thing, like a whole circle, is 1 **unit,** or 1. The circle at A is divided into 4 fourths. You know that $\frac{4}{4} = 1$. In the fraction $\frac{4}{4}$, the numerator **equals** the denominator.

2. Part of the circle at B is missing. There is only $\frac{3}{4}$ of the circle left. The fraction $\frac{3}{4}$ is **less than** 1. In $\frac{3}{4}$ the numerator is **smaller than** the denominator.

3. At C you see 1 whole circle and $\frac{1}{4}$ of another circle. All together you see $\frac{5}{4}$ of a circle. The fraction $\frac{5}{4}$ is **more than** 1. In $\frac{5}{4}$ the numerator is **larger than** the denominator.

4. You can write what you see at C in another way. There is 1 whole circle and $\frac{1}{4}$ of another circle, or $1\frac{1}{4}$ of a circle in all. $1\frac{1}{4}$ is a mixed number. Does $1\frac{1}{4} = \frac{5}{4}$? Yes

Stress. **5.** Fractions like $\frac{3}{4}$, $\frac{2}{3}$, and $\frac{5}{6}$, in which the numerator is smaller than the denominator, are called **proper fractions.** A proper fraction is always smaller than 1. Write 5 proper fractions.

Stress. **6.** Fractions like $\frac{4}{4}$, $\frac{6}{6}$, $\frac{5}{4}$, and $\frac{7}{3}$, in which the numerator is **equal to** or **larger than** the denominator, are called **improper fractions.** You see that $\frac{4}{4}$ and $\frac{6}{6}$ each equal 1. The numerator in these improper fractions equals the denominator. Improper fractions like $\frac{5}{4}$ and $\frac{7}{3}$ are larger than 1. In these fractions the numerator is larger than the denominator. Write 6 improper fractions, 3 of each kind.

7. Tell which are (P) proper and which are (I) improper fractions:

$\frac{5}{6}$ P $\frac{9}{8}$ I $\frac{4}{4}$ I $\frac{2}{3}$ P $\frac{6}{6}$ I $\frac{5}{12}$ P $\frac{13}{16}$ P $\frac{15}{12}$ I $\frac{16}{16}$ I

Do this work slowly with pupils, using flannelboard to demonstrate. Have pupils use fractional kits in following discussion and to show proper and improper fractions.

Changing Improper Fractions

Tell which are proper (P) and which are improper (I) fractions:

1. $\frac{9}{9}$ I $\frac{7}{8}$ P $\frac{9}{5}$ I $\frac{1}{6}$ P $\frac{5}{5}$ I $\frac{11}{12}$ P $\frac{17}{10}$ I $\frac{5}{16}$ P $\frac{16}{16}$ I

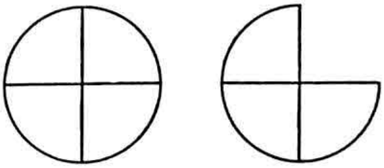
2. Look at C on page 122. This shows that $\frac{5}{4} = 1\frac{1}{4}$. $\frac{5}{4}$ is an improper fraction and $1\frac{1}{4}$ is a mixed number. You can change an improper fraction to a mixed number. Some improper fractions, like $\frac{5}{5}$ and $\frac{12}{6}$, equal a whole number.

3. Here is one way to think to change the improper fraction $\frac{3}{2}$ to a mixed number. Think, "$\frac{3}{2} = \frac{2}{2} + \frac{1}{2}$. $\frac{2}{2} = 1$, so $\frac{3}{2} = 1\frac{1}{2}$."

4. You also know that $\frac{3}{2}$ means $3 \div 2$. You can find that $\frac{3}{2} = 1\frac{1}{2}$ by dividing the numerator 3 by the denominator 2 and using the remainder to give a fraction in the quotient.

$$\begin{array}{r} 1\frac{1}{2} \\ 2\overline{)3} \\ 2 \\ \hline 1 \end{array}$$

5. Here is a picture that shows that $\frac{7}{4} = 1\frac{3}{4}$. Draw a picture to show the mixed number that equals $\frac{11}{8}$; that equals $\frac{15}{8}$.



Show by dividing that these are true:

6. $\frac{9}{5} = 1\frac{4}{5}$ $\frac{8}{6} = 1\frac{2}{6} = 1\frac{1}{3}$ $\frac{15}{5} = 3$ $\frac{18}{4} = 4\frac{2}{4} = 4\frac{1}{2}$

Change to whole numbers or mixed numbers. Change fractions in mixed numbers to lowest terms: Use line drawings to prove answers.

7. $\frac{5}{2}$ $2\frac{1}{2}$ $\frac{5}{3}$ $1\frac{2}{3}$ $\frac{7}{2}$ $3\frac{1}{2}$ $\frac{6}{5}$ $1\frac{1}{5}$ $\frac{8}{6}$ $1\frac{1}{3}$ $\frac{9}{9}$ 1 $\frac{16}{12}$ $1\frac{1}{3}$ $\frac{11}{3}$ $3\frac{2}{3}$ $\frac{10}{10}$ 1

More Practice. See ⑯ on page 315. Use for further explanation.

Emphasize.

To change an improper fraction to a whole number or to a mixed number, you can divide its numerator by its denominator.

Give pupils many opportunities to change improper fractions to whole or mixed numbers (by combining fractional parts or illustrating with line drawings). Urge them to make generalization before discussing ex. 4.

Extend addition of like fractions where sum is improper fraction.

How Far Did They Go?

1. **Problem** To get to Clear Lake Joe and Tom went $\frac{7}{8}$ mi. on their bicycles. Then they walked $\frac{5}{8}$ mi. through the woods. How many miles did the boys go all together? $1\frac{1}{2}$

   Explanation Write $\frac{5}{8}$ under $\frac{7}{8}$ and add. The sum is $\frac{12}{8}$. Change this improper fraction to a mixed number, which gives $1\frac{4}{8}$ or $1\frac{1}{2}$. The boys went $1\frac{1}{2}$ mi. in all.

$$\begin{array}{r} \frac{7}{8} \\ \frac{5}{8} \\ \hline \frac{12}{8} = 1\frac{4}{8} \text{ or } 1\frac{1}{2} \end{array}$$

2. Bill walked $\frac{3}{4}$ mi. to school and $\frac{1}{4}$ mi. to the library. How far did Bill walk all together? $\frac{3}{4} + \frac{1}{4} =$ . . 1 . 1 mi.

3. Ann walked $\frac{1}{2}$ mi. to school and $\frac{1}{2}$ mi. back home. How many miles did Ann walk? 1

4. Betty lives $\frac{5}{8}$ mi. from school. How far does Betty have to walk when she goes to school and back? $1\frac{2}{8}$ mi., or $1\frac{1}{4}$ mi.

If necessary, let pupils use materials or make drawings to find sums.

Add. Check your work by going over it:

5.	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{5}{6}$	$\frac{1}{8}$	$\frac{7}{10}$	$\frac{7}{16}$	$\frac{11}{12}$	$\frac{3}{10}$
	$\frac{3}{4}$	$\frac{3}{5}$	$\frac{5}{6}$	$\frac{7}{8}$	$\frac{3}{10}$	$\frac{15}{16}$	$\frac{5}{12}$	$\frac{9}{10}$
	$1\frac{1}{2}$	$1\frac{2}{5}$	$1\frac{2}{3}$	1	1	$1\frac{3}{8}$	$1\frac{1}{3}$	$1\frac{1}{5}$
6.	$\frac{7}{8}$	$\frac{2}{3}$	$\frac{5}{8}$	$\frac{2}{5}$	$\frac{11}{16}$	$\frac{9}{10}$	$\frac{9}{16}$	$\frac{5}{16}$
	$\frac{3}{8}$	$\frac{1}{3}$	$\frac{3}{8}$	$\frac{3}{5}$	$\frac{9}{16}$	$\frac{9}{10}$	$\frac{9}{16}$	$\frac{11}{16}$
	$1\frac{1}{4}$	1	1	1	$1\frac{1}{4}$	$1\frac{4}{5}$	$1\frac{1}{8}$	1

More Practice. See ⑰ on page 316. Use for individual assistance.

Do ex. 1-4 with pupils, stressing that they show answer as in ex. 1 explanation ($\frac{12}{8} = 1\frac{4}{8}$ or $1\frac{1}{2}$). Have pupils do ex. 5-6 independently. Remind them to include whole number in final answer, after changing fraction.

Teach addition of mixed numbers where sum is whole number and improper fraction.

Adding Mixed Numbers

1. Study these examples:

$$\begin{array}{l} 2\frac{1}{3} \\ \underline{3\frac{2}{3}} \\ 5\frac{3}{3} = 5 + 1 = 6 \end{array} \qquad \begin{array}{l} 1\frac{4}{5} \\ \underline{1\frac{3}{5}} \\ 2\frac{7}{5} = 2 + 1\frac{2}{5} = 3\frac{2}{5} \end{array} \qquad \begin{array}{l} 4\frac{3}{4} \\ \underline{2\frac{3}{4}} \\ 6\frac{6}{4} = 6 + 1\frac{2}{4} = 7\frac{2}{4} = 7\frac{1}{2} \end{array}$$

2. Bill went to the movies Saturday afternoon. He saw a picture about cowboys that ran $1\frac{3}{4}$ hr. Then he saw news and sports for $1\frac{1}{4}$ hr. How many hours did Bill stay at the movies? $2\frac{4}{4}$, or 3

3. At the store Jean bought a chicken weighing $4\frac{3}{8}$ lb. and lamb weighing $1\frac{7}{8}$ lb. How much did both weigh? $6\frac{1}{4}$ lb.

4. On a vacation trip John rode $2\frac{3}{4}$ hr. in an airplane and $\frac{3}{4}$ hr. in a bus. How many hours did he ride in all? $3\frac{1}{2}$

5. Mary used $1\frac{2}{3}$ cups of sugar for a cake and $1\frac{1}{3}$ cups for cookies. How many cups of sugar did Mary use? 3

6. Mary used $2\frac{1}{4}$ cups of flour for the cake and $2\frac{3}{4}$ cups for the cookies. How many cups of flour did Mary use? 5

7. Tom rode his new bicycle $2\frac{3}{4}$ mi. to Uncle Joe's farm. How many miles did he ride to go there and back? $5\frac{1}{2}$

Add. Check by going over your work: Have pupils do work as in ex. 1.

8.	$2\frac{3}{8}$ $\underline{1\frac{7}{8}}$ $4\frac{1}{4}$	$5\frac{2}{3}$ $\underline{2\frac{2}{3}}$ $8\frac{1}{3}$	$4\frac{3}{5}$ $\underline{1\frac{3}{5}}$ $6\frac{1}{5}$	$4\frac{7}{12}$ $\underline{5\frac{5}{12}}$ 10	$5\frac{5}{10}$ $\underline{1\frac{7}{10}}$ $7\frac{1}{5}$	$1\frac{11}{12}$ $\underline{9\frac{1}{12}}$ 11	$3\frac{15}{16}$ $\underline{6\frac{5}{16}}$ $10\frac{1}{4}$
9.	$3\frac{3}{4}$ $\underline{4\frac{3}{4}}$ $8\frac{1}{2}$	$5\frac{7}{8}$ $\underline{5\frac{7}{8}}$ $11\frac{3}{4}$	$4\frac{1}{2}$ $\underline{8\frac{1}{2}}$ 13	$5\frac{3}{10}$ $\underline{3\frac{7}{10}}$ 9	$4\frac{7}{12}$ $\underline{4\frac{11}{12}}$ $9\frac{1}{2}$	$6\frac{13}{16}$ $\underline{7\frac{9}{16}}$ $14\frac{3}{8}$	$2\frac{9}{10}$ $\underline{2\frac{9}{10}}$ $5\frac{4}{5}$
10.	$3\frac{5}{6}$ $\underline{2\frac{5}{6}}$ $6\frac{2}{3}$	$6\frac{1}{4}$ $\underline{3\frac{3}{4}}$ 10	$1\frac{7}{8}$ $\underline{1\frac{1}{8}}$ 3	$3\frac{9}{16}$ $\underline{3\frac{7}{16}}$ 7	$5\frac{7}{10}$ $\underline{4\frac{7}{10}}$ $10\frac{2}{5}$	$6\frac{7}{12}$ $\underline{1\frac{7}{12}}$ $8\frac{1}{6}$	$4\frac{15}{16}$ $\underline{2\frac{15}{16}}$ $7\frac{7}{8}$

More Practice. See ⑱ on page 316. Use to reinforce skill.

Demonstrate ex. 1 with materials, drawings on board, or line drawings. Then do ex. 2-7 with pupils, letting them use fractional parts if necessary. In ex. 8-10, be sure pupils include sum of whole numbers in final sum.

Give further practice in addition of mixed numbers where sum is whole number and improper fraction, and in subtraction of mixed numbers.

Problems and Practice

1. Mother mailed a box of candy to Bob. The weight of the candy was $2\frac{1}{2}$ lb. and the box, paper, and string weighed $\frac{1}{2}$ lb. How much did the box weigh when it was ready to be mailed? 3 lb.

2. Sally weighs $78\frac{3}{4}$ lb. She says she has gained $3\frac{1}{4}$ lb. since September. How many pounds did Sally weigh before she gained weight? $75\frac{1}{2}$

3. Mrs. Jackson is going to make a dress for Betty and one for herself. She needs $2\frac{3}{4}$ yd. for Betty and $3\frac{3}{4}$ yd. for herself. If she makes both dresses from the same wool cloth, how many yards must she buy? $6\frac{1}{2}$

4. Write as mixed numbers: $\frac{17}{8}$, $\frac{14}{5}$, $\frac{15}{4}$, $\frac{14}{6}$, $\frac{25}{4}$, $\frac{27}{8}$.
$2\frac{1}{8}$ $2\frac{4}{5}$ $3\frac{3}{4}$ $2\frac{1}{3}$ $6\frac{1}{4}$ $3\frac{3}{8}$

Find the sums:

5. $4\frac{3}{8} + 2\frac{7}{8}$ $7\frac{1}{4}$ $5\frac{2}{3} + 4\frac{2}{3}$ $10\frac{1}{3}$ $6\frac{7}{10} + 2\frac{3}{10}$ 9 $1\frac{1}{2} + 4\frac{1}{2}$ 6

6. $1\frac{5}{6} + 2\frac{1}{6}$ 4 $3\frac{5}{8} + 2\frac{5}{8}$ $6\frac{1}{4}$ $3\frac{1}{12} + 6\frac{11}{12}$ 10 $2\frac{3}{4} + 2\frac{1}{4}$ 5

Add. Change fractions in answers to lowest terms: Stress.

7.	$\begin{array}{r}2\frac{7}{8}\\ 1\frac{5}{8}\\ \hline 4\frac{1}{2}\end{array}$	$\begin{array}{r}8\frac{4}{5}\\ 6\frac{3}{5}\\ \hline 15\frac{2}{5}\end{array}$	$\begin{array}{r}5\frac{3}{4}\\ 2\frac{3}{4}\\ \hline 8\frac{1}{2}\end{array}$	$\begin{array}{r}7\frac{9}{10}\\ 5\frac{1}{10}\\ \hline 13\end{array}$	$\begin{array}{r}8\frac{11}{16}\\ 4\frac{5}{16}\\ \hline 13\end{array}$	$\begin{array}{r}5\frac{11}{12}\\ 4\frac{5}{12}\\ \hline 10\frac{1}{3}\end{array}$	$\begin{array}{r}7\frac{3}{10}\\ 3\frac{1}{10}\\ \hline 10\frac{2}{5}\end{array}$
8.	$\begin{array}{r}4\frac{3}{5}\\ 3\frac{2}{5}\\ \hline 8\end{array}$	$\begin{array}{r}9\frac{5}{6}\\ 4\frac{5}{6}\\ \hline 14\frac{2}{3}\end{array}$	$\begin{array}{r}8\frac{7}{8}\\ 3\frac{1}{8}\\ \hline 12\end{array}$	$\begin{array}{r}9\frac{7}{12}\\ 1\frac{1}{12}\\ \hline 10\frac{2}{3}\end{array}$	$\begin{array}{r}6\frac{7}{10}\\ 2\frac{3}{10}\\ \hline 9\end{array}$	$\begin{array}{r}5\frac{9}{16}\\ 3\frac{1}{16}\\ \hline 8\frac{5}{8}\end{array}$	$\begin{array}{r}2\frac{11}{12}\\ 2\frac{1}{12}\\ \hline 5\end{array}$

9. Subtract the numbers in ex. 7 and 8.
Ex. 7: $1\frac{1}{4}$, $2\frac{1}{5}$, 3, $2\frac{4}{5}$, $4\frac{3}{8}$, $1\frac{1}{2}$, $4\frac{1}{5}$; ex. 8: $1\frac{1}{5}$, 5, $5\frac{3}{4}$, $8\frac{1}{2}$, $4\frac{2}{5}$, $2\frac{1}{2}$, $\frac{5}{6}$

10. In the basket on her bicycle Mary carried packages weighing $5\frac{1}{2}$ lb. and $3\frac{1}{2}$ lb. How much did both packages weigh? 9 lb.

11. Bill is $63\frac{1}{2}$ in. tall and Joe is 62 in. tall. How many inches taller than Joe is Bill? $1\frac{1}{2}$

12. Tom had a hen that weighed $5\frac{3}{8}$ lb. When it was ready to cook, it weighed $4\frac{1}{8}$ lb. How much weight was lost? $1\frac{1}{4}$ lb.

Remind pupils of reason why we can add or subtract these mixed numbers (since denominators of fractions are same). Emphasize that answers must be changed to lowest terms, and final sum includes sum of whole numbers.

More Subtraction

Give the answers to ex. 1–3 in simplest form: Stress.

1. $\frac{7}{8} - \frac{5}{8}$ $\frac{1}{4}$ $\frac{4}{5} - \frac{1}{5}$ $\frac{3}{5}$ $\frac{5}{8} - \frac{3}{8}$ $\frac{1}{4}$ $\frac{9}{10} - \frac{7}{10}$ $\frac{1}{5}$ $\frac{3}{16} - \frac{1}{16}$ $\frac{1}{8}$

2. $\frac{2}{3} - \frac{1}{3}$ $\frac{1}{3}$ $\frac{6}{7} - \frac{2}{7}$ $\frac{4}{7}$ $\frac{3}{4} - \frac{1}{4}$ $\frac{1}{2}$ $\frac{9}{12} - \frac{7}{12}$ $\frac{1}{6}$ $\frac{7}{12} - \frac{1}{12}$ $\frac{1}{2}$

3. $\frac{3}{4} - \frac{3}{4}$ 0 $\frac{5}{6} - \frac{1}{6}$ $\frac{2}{3}$ $\frac{3}{5} - \frac{2}{5}$ $\frac{1}{5}$ $\frac{9}{16} - \frac{7}{16}$ $\frac{1}{8}$ $\frac{3}{10} - \frac{1}{10}$ $\frac{1}{5}$

4. In a running race Tom's time was $7\frac{7}{10}$ sec. and Bill's time was $7\frac{3}{10}$ sec. How much better was Bill's time than Tom's? $\frac{2}{5}$ sec.

5. Mrs. Green needs $3\frac{3}{4}$ yd. of cloth for a dress. At a sale she saw a piece $3\frac{1}{4}$ yd. long. How much too short was it? $\frac{1}{2}$ yd.

6. Some boys rode $4\frac{3}{4}$ hr. on their bicycles. They also stopped $\frac{3}{4}$ hr. for lunch. How many hours were they gone? $5\frac{1}{2}$

Subtract. Check your work by going over it:

7.	$\begin{array}{r} 7\frac{5}{8} \\ \underline{4\frac{3}{8}} \\ 3\frac{1}{4} \end{array}$	$\begin{array}{r} 9\frac{5}{12} \\ \underline{7\frac{1}{12}} \\ 2\frac{1}{3} \end{array}$	$\begin{array}{r} 7\frac{4}{5} \\ \underline{2\frac{2}{5}} \\ 5\frac{2}{5} \end{array}$	$\begin{array}{r} 4\frac{7}{10} \\ \underline{4\frac{3}{10}} \\ \frac{2}{5} \end{array}$	$\begin{array}{r} 9\frac{9}{16} \\ \underline{6\frac{3}{16}} \\ 3\frac{3}{8} \end{array}$	$\begin{array}{r} 6\frac{11}{12} \\ \underline{3\frac{7}{12}} \\ 3\frac{1}{3} \end{array}$	$\begin{array}{r} 9\frac{7}{16} \\ \underline{2} \\ 7\frac{7}{16} \end{array}$
8.	$\begin{array}{r} 3\frac{2}{3} \\ \underline{2\frac{1}{3}} \\ 1\frac{1}{3} \end{array}$	$\begin{array}{r} 7\frac{11}{16} \\ \underline{1\frac{3}{16}} \\ 6\frac{1}{2} \end{array}$	$\begin{array}{r} 8\frac{3}{4} \\ \underline{5\frac{3}{4}} \\ 3 \end{array}$	$\begin{array}{r} 9\frac{7}{12} \\ \underline{4\frac{1}{12}} \\ 5\frac{1}{2} \end{array}$	$\begin{array}{r} 7\frac{5}{12} \\ \underline{6\frac{1}{12}} \\ 1\frac{1}{3} \end{array}$	$\begin{array}{r} 2\frac{15}{16} \\ \underline{\frac{11}{16}} \\ 2\frac{1}{4} \end{array}$	$\begin{array}{r} 4\frac{5}{12} \\ \underline{3\frac{5}{12}} \\ 1 \end{array}$
9.	$\begin{array}{r} 8\frac{3}{4} \\ \underline{4\frac{1}{4}} \\ 4\frac{1}{2} \end{array}$	$\begin{array}{r} 6\frac{9}{10} \\ \underline{6\frac{3}{10}} \\ \frac{3}{5} \end{array}$	$\begin{array}{r} 4\frac{7}{8} \\ \underline{1\frac{7}{8}} \\ 3 \end{array}$	$\begin{array}{r} 2\frac{13}{16} \\ \underline{2\frac{5}{16}} \\ \frac{1}{2} \end{array}$	$\begin{array}{r} 6\frac{9}{10} \\ \underline{5\frac{1}{10}} \\ 1\frac{4}{5} \end{array}$	$\begin{array}{r} 8\frac{11}{12} \\ \underline{2\frac{1}{12}} \\ 6\frac{5}{6} \end{array}$	$\begin{array}{r} 9\frac{15}{16} \\ \underline{8\frac{1}{16}} \\ 1\frac{7}{8} \end{array}$
10.	$\begin{array}{r} 6\frac{7}{8} \\ \underline{1\frac{5}{8}} \\ 5\frac{1}{4} \end{array}$	$\begin{array}{r} 8\frac{11}{12} \\ \underline{7\frac{1}{12}} \\ 1\frac{5}{6} \end{array}$	$\begin{array}{r} 5\frac{4}{5} \\ \underline{4\frac{1}{5}} \\ 1\frac{3}{5} \end{array}$	$\begin{array}{r} 4\frac{5}{12} \\ \underline{2\frac{5}{12}} \\ 2 \end{array}$	$\begin{array}{r} 9\frac{9}{16} \\ \underline{9\frac{5}{16}} \\ \frac{1}{4} \end{array}$	$\begin{array}{r} 5\frac{3}{10} \\ \underline{3\frac{1}{10}} \\ 2\frac{1}{5} \end{array}$	$\begin{array}{r} 7\frac{11}{12} \\ \underline{5\frac{5}{12}} \\ 2\frac{1}{2} \end{array}$

11. Mary needs $2\frac{7}{8}$ yd. of cloth for a dress and $1\frac{3}{8}$ yd. of cloth for a skirt. How many more yards does she need for the dress than for the skirt? $1\frac{1}{2}$

12. Jack practiced his music lesson $4\frac{3}{4}$ hr. last week. This week he practiced only $2\frac{1}{4}$ hr. How many hours less has he practiced this week than last? $2\frac{1}{2}$

Let pupils show answers in ex. 1–3 on flannelboard (where possible). Emphasize order of subtraction (see page 120). Remind pupils that fraction is in lowest terms when there is no number, except 1, by which both terms can be divided.

Give experience in everyday uses of fractions in kitchens, at work, in stores, with measures.

Where Do You Use Fractions?

1. For a cool drink for her friends Susan mixed $2\frac{3}{4}$ cups of pineapple juice and $2\frac{1}{4}$ cups of orange juice. How much juice did Susan use? 5 cups Then she added as much water as juice. How many cups of the drink did Susan make? 10

2. Mary needs $5\frac{3}{4}$ yd. of ribbon for her dress and $1\frac{3}{4}$ yd. of the same ribbon for her hat. How many yards of ribbon should Mary buy? $7\frac{1}{2}$

3. Jim wants to practice on his drum $1\frac{3}{4}$ hr. today. He practiced $\frac{3}{4}$ hr. before school this morning. How much longer must he practice today? 1 hr.

4. Mrs. Green bought two chickens. One weighed $2\frac{11}{16}$ lb. and the other weighed $2\frac{13}{16}$ lb. How many pounds of chicken did Mrs. Green buy? $5\frac{1}{2}$

5. Jack walked $2\frac{1}{4}$ mi. to camp and $\frac{3}{4}$ mi. more to the camp store. How many miles did he walk? 3

6. Betty's mother has a piece of cloth $4\frac{1}{4}$ yd. long. Has she enough cloth to use $2\frac{3}{4}$ yd. for Betty's dress and $1\frac{1}{4}$ yd. for a short coat? Yes, $\frac{1}{4}$ yd. extra

Let pupils do problems independently. Observe them as they work: note any difficulties with mixed numbers, changing improper fractions, changing to lowest terms, and so on.

After doing problems have pupils suggest other ways of using fractions in everyday experiences.

7. Joe rode his bicycle $5\frac{7}{10}$ mi. this morning. This afternoon he rode $4\frac{8}{10}$ mi. more. How many miles in all did Joe ride his bicycle today? $10\frac{5}{10}$, or $10\frac{1}{2}$

8. Mr. Fellows cut two pieces of cheese. One weighed $\frac{11}{16}$ lb. and the other weighed $\frac{7}{16}$ lb. How much heavier was one piece than the other? $\frac{1}{4}$ lb.

9. Mother wants to roast a piece of meat $2\frac{3}{4}$ hr. She will put potatoes in the oven $1\frac{1}{4}$ hr. before the meat is done. How long after she starts roasting the meat should she put the potatoes in the oven? $1\frac{1}{2}$ hr.

10. In ex. 9, Mother wants the piece of meat and the potatoes ready at 5:45 P.M. At what time in the afternoon should she put the meat in the oven? 3 o'clock

11. Jim worked for Mr. Brown $1\frac{1}{4}$ hr. on Friday and $3\frac{3}{4}$ hr. on Saturday. He was paid \$.60 an hour. How much did Jim earn both days? \$ 3.00

12. The girls in Ann's class bought $22\frac{7}{8}$ yd. of cloth for clown suits and $15\frac{5}{8}$ yd. for cowboy suits. How many yards of cloth did they buy? $38\frac{1}{2}$

Use results of test as basis for reteaching, if needed. Help pupils determine cause of errors.

Fraction Review

1. Change each of these fractions to lowest terms:

$\frac{4}{8}$ $\frac{1}{2}$ $\frac{3}{6}$ $\frac{1}{2}$ $\frac{10}{15}$ $\frac{2}{3}$ $\frac{6}{10}$ $\frac{3}{5}$ $\frac{10}{12}$ $\frac{5}{6}$ $\frac{4}{12}$ $\frac{1}{3}$ $\frac{12}{16}$ $\frac{3}{4}$ $\frac{8}{16}$ $\frac{1}{2}$

2. Change these fractions to whole numbers or mixed numbers. Change fractions in answers to lowest terms:

$\frac{8}{3}$ $2\frac{2}{3}$ $\frac{4}{4}$ 1 $\frac{11}{5}$ $2\frac{1}{5}$ $\frac{14}{4}$ $3\frac{1}{2}$ $\frac{20}{5}$ 4 $\frac{10}{10}$ 1 $\frac{20}{8}$ $2\frac{1}{2}$ $\frac{24}{8}$ 3

3. Name the numerator and the denominator of each fraction in ex. 1. In ex. 1 and 2, name 3 proper fractions and 3 improper fractions.

4. Mary cut off $2\frac{1}{4}$ yd. of cloth from a piece of cloth $10\frac{3}{4}$ yd. long. How many yards were left in the piece? $8\frac{1}{2}$

Add or subtract. Watch the signs:

5. $\frac{3}{5} - \frac{1}{5}$ $\frac{2}{5}$ $\frac{1}{3} + \frac{1}{3}$ $\frac{2}{3}$ $\frac{1}{6} + \frac{5}{6}$ 1 $\frac{2}{3} - \frac{2}{3}$ 0 $\frac{1}{2} - \frac{1}{2}$ 0

6. $\frac{1}{8} + \frac{1}{8}$ $\frac{1}{4}$ $\frac{2}{5} + \frac{4}{5}$ $1\frac{1}{5}$ $\frac{5}{8} - \frac{1}{8}$ $\frac{1}{2}$ $\frac{3}{4} + \frac{1}{4}$ 1 $\frac{5}{6} - \frac{4}{6}$ $\frac{1}{6}$

Add. Check your work by going over it:

7.	$\frac{5}{12}$	$\frac{7}{8}$	$4\frac{2}{3}$	$2\frac{1}{16}$	$4\frac{7}{10}$	$3\frac{5}{12}$	$3\frac{9}{16}$
	$\frac{7}{12}$	$\frac{3}{8}$	$1\frac{2}{3}$	$5\frac{1}{16}$	$\frac{7}{10}$	$2\frac{5}{12}$	$3\frac{11}{16}$
	1	$1\frac{1}{4}$	$6\frac{1}{3}$	$7\frac{1}{8}$	$5\frac{2}{5}$	$5\frac{5}{6}$	$7\frac{1}{4}$
8.	$\frac{9}{10}$	$\frac{5}{6}$	$4\frac{7}{8}$	$\frac{7}{12}$	$6\frac{1}{10}$	$1\frac{11}{16}$	$2\frac{11}{12}$
	$\frac{3}{10}$	$\frac{5}{6}$	$\frac{7}{8}$	$2\frac{5}{12}$	$3\frac{7}{10}$	$1\frac{13}{16}$	$7\frac{7}{12}$
	$1\frac{1}{5}$	$1\frac{2}{3}$	$5\frac{3}{4}$	3	$9\frac{4}{5}$	$3\frac{1}{2}$	$10\frac{1}{2}$

9. Mother needs $\frac{3}{4}$ cup of shelled nuts for a cake and $\frac{3}{4}$ cup for cookies. How many cups of shelled nuts does she need? $1\frac{1}{2}$

Subtract. Check your work by going over it:

10.	$\frac{9}{16}$	$\frac{5}{6}$	$6\frac{1}{2}$	$9\frac{9}{16}$	$5\frac{11}{12}$	$4\frac{9}{10}$	$3\frac{15}{16}$
	$\frac{1}{16}$	$\frac{1}{6}$	4	$2\frac{5}{16}$	$3\frac{5}{12}$	$2\frac{4}{10}$	$1\frac{9}{16}$
	$\frac{1}{2}$	$\frac{2}{3}$	$2\frac{1}{2}$	$7\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{8}$
11.	$\frac{11}{12}$	$\frac{7}{8}$	$7\frac{3}{4}$	$6\frac{7}{12}$	$8\frac{7}{10}$	$7\frac{11}{16}$	$9\frac{7}{10}$
	$\frac{5}{12}$	$\frac{1}{8}$	$1\frac{3}{4}$	$3\frac{5}{12}$	$4\frac{1}{10}$	$4\frac{3}{16}$	$6\frac{3}{10}$
	$\frac{1}{2}$	$\frac{3}{4}$	6	$3\frac{1}{6}$	$4\frac{3}{5}$	$3\frac{1}{2}$	$3\frac{2}{5}$

Although some pupils may need pencil and paper in finding answers, urge pupils to do most examples mentally.

Present timed tests on the four basic operations.

Testing Your Skill

You should be able to do all the exercises in each test correctly in the time allowed.

Addition Test

Add. Write the answers on folded paper: Time: 3 min.

1.	3371	8208	7286	5647	5784
	4092	1976	1785	9830	8549
	1364	5487	4266	1997	4363
	2057	4625	3358	2526	3438
	10,884	20,296	16,695	20,000	22,134

Subtraction Test

Subtract. Write the answers on folded paper: Time: 3 min.

2.	5828	3234	8962	5157	1000
	4483	935	7889	4168	439
	1345	2299	1073	989	561
3.	7866	8037	1345	9000	4933
	4962	6097	787	6857	1936
	2904	1940	558	2143	2997

Multiplication Test

Copy and multiply: Time: 5 min. after copying.*

4.	734	496	467	205	528	619
	639	215	408	197	283	706
	469,026	106,640	190,536	40,385	149,424	437,014

Division Test

Copy and divide: Time: 6 min. after copying.*

5.	$\overset{73}{32\overline{)2336}}$	$\overset{86}{41\overline{)3526}}$	$\overset{85}{23\overline{)1955}}$	$\overset{59\text{R}7}{60\overline{)3547}}$
6.	$\overset{72\text{R}11}{45\overline{)3251}}$	$\overset{49}{33\overline{)1617}}$	$\overset{39}{54\overline{)2106}}$	$\overset{64}{25\overline{)1600}}$

---

* In the multiplication and division tests, copy all the exercises on a sheet of paper before taking the test. In copying spread the exercises over the sheet to allow space for the work. See page 328.

See pages 71 and 103 for suggestions and G-32 for discussion of timed tests. Use "More Practice" pages and developmental material found on pages related to pupils' difficulties in reteaching or reviewing further.

Use results of test as basis for reteaching, if needed.
Help pupils determine cause of errors.

Fraction Review

1. Change each of these fractions to lowest terms:

$\frac{4}{8}$ $\frac{1}{2}$ $\frac{3}{6}$ $\frac{1}{2}$ $\frac{10}{15}$ $\frac{2}{3}$ $\frac{6}{10}$ $\frac{3}{5}$ $\frac{10}{12}$ $\frac{5}{6}$ $\frac{4}{12}$ $\frac{1}{3}$ $\frac{12}{16}$ $\frac{3}{4}$ $\frac{8}{16}$ $\frac{1}{2}$

2. Change these fractions to whole numbers or mixed numbers. Change fractions in answers to lowest terms:

$\frac{8}{3}$ $2\frac{2}{3}$ $\frac{4}{4}$ 1 $\frac{11}{5}$ $2\frac{1}{5}$ $\frac{14}{4}$ $3\frac{1}{2}$ $\frac{20}{5}$ 4 $\frac{10}{10}$ 1 $\frac{20}{8}$ $2\frac{1}{2}$ $\frac{24}{8}$ 3

3. Name the numerator and the denominator of each fraction in ex. 1. In ex. 1 and 2, name 3 proper fractions and 3 improper fractions.

4. Mary cut off $2\frac{1}{4}$ yd. of cloth from a piece of cloth $10\frac{3}{4}$ yd. long. How many yards were left in the piece? $8\frac{1}{2}$

Add or subtract. Watch the signs:

5. $\frac{3}{5} - \frac{1}{5}$ $\frac{2}{5}$ $\frac{1}{3} + \frac{1}{3}$ $\frac{2}{3}$ $\frac{1}{6} + \frac{5}{6}$ 1 $\frac{2}{3} - \frac{2}{3}$ 0 $\frac{1}{2} - \frac{1}{2}$ 0

6. $\frac{1}{8} + \frac{1}{8}$ $\frac{1}{4}$ $\frac{2}{5} + \frac{4}{5}$ $1\frac{1}{5}$ $\frac{5}{8} - \frac{1}{8}$ $\frac{1}{2}$ $\frac{3}{4} + \frac{1}{4}$ 1 $\frac{5}{6} - \frac{4}{6}$ $\frac{1}{6}$

Add. Check your work by going over it:

7.	$\frac{5}{12}$	$\frac{7}{8}$	$4\frac{2}{3}$	$2\frac{1}{16}$	$4\frac{7}{10}$	$3\frac{5}{12}$	$3\frac{9}{16}$
	$\frac{7}{12}$	$\frac{3}{8}$	$1\frac{2}{3}$	$5\frac{1}{16}$	$\frac{7}{10}$	$2\frac{5}{12}$	$3\frac{11}{16}$
	1	$1\frac{1}{4}$	$6\frac{1}{3}$	$7\frac{1}{8}$	$5\frac{2}{5}$	$5\frac{5}{6}$	$7\frac{1}{4}$
8.	$\frac{9}{10}$	$\frac{5}{6}$	$4\frac{7}{8}$	$\frac{7}{12}$	$6\frac{1}{10}$	$1\frac{11}{16}$	$2\frac{11}{12}$
	$\frac{3}{10}$	$\frac{5}{6}$	$\frac{7}{8}$	$2\frac{5}{12}$	$3\frac{7}{10}$	$1\frac{13}{16}$	$7\frac{7}{12}$
	$1\frac{1}{5}$	$1\frac{2}{3}$	$5\frac{3}{4}$	3	$9\frac{4}{5}$	$3\frac{1}{2}$	$10\frac{1}{2}$

9. Mother needs $\frac{3}{4}$ cup of shelled nuts for a cake and $\frac{3}{4}$ cup for cookies. How many cups of shelled nuts does she need? $1\frac{1}{2}$

Subtract. Check your work by going over it:

10.	$\frac{9}{16}$	$\frac{5}{6}$	$6\frac{1}{2}$	$9\frac{9}{16}$	$5\frac{11}{12}$	$4\frac{9}{10}$	$3\frac{15}{16}$
	$\frac{1}{16}$	$\frac{1}{6}$	4	$2\frac{5}{16}$	$3\frac{5}{12}$	$2\frac{4}{10}$	$1\frac{9}{16}$
	$\frac{1}{2}$	$\frac{2}{3}$	$2\frac{1}{2}$	$7\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{8}$
11.	$\frac{11}{12}$	$\frac{7}{8}$	$7\frac{3}{4}$	$6\frac{7}{12}$	$8\frac{7}{10}$	$7\frac{11}{16}$	$9\frac{7}{10}$
	$\frac{5}{12}$	$\frac{1}{8}$	$1\frac{3}{4}$	$3\frac{5}{12}$	$4\frac{1}{10}$	$4\frac{3}{16}$	$6\frac{3}{10}$
	$\frac{1}{2}$	$\frac{3}{4}$	6	$3\frac{1}{6}$	$4\frac{3}{5}$	$3\frac{1}{2}$	$3\frac{2}{5}$

Although some pupils may need pencil and paper in finding answers, urge pupils to do most examples mentally.

Present timed tests on the four basic operations.

Testing Your Skill

You should be able to do all the exercises in each test correctly in the time allowed.

Addition Test

Add. Write the answers on folded paper: Time: 3 min.

1. 3371	8208	7286	5647	5784
4092	1976	1785	9830	8549
1364	5487	4266	1997	4363
2057	4625	3358	2526	3438
10,884	20,296	16,695	20,000	22,134

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Subtract. Write the answers on folded paper: Time: 3 min.

2. 5828	3234	8962	5157	1000
4483	935	7889	4168	439
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4962	6097	787	6857	1936
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4. 734	496	467	205	528	619
639	215	408	197	283	706
469,026	106,640	190,536	40,385	149,424	437,014

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Copy and divide: Time: 6 min. after copying.*

73	86	85	59R7
5. 32)2336	41)3526	23)1955	60)3547
72R11	49	39	64
6. 45)3251	33)1617	54)2106	25)1600

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See G-50 for correlation of examples with aims.

Chapter Review

1. Draw a circle and divide it into 8 equal parts. Then show that $\frac{1}{4} = \frac{2}{8}$, that $\frac{3}{4} = \frac{6}{8}$, and that $\frac{1}{2} = \frac{2}{4}$.
2. Change to lowest terms: $\frac{5}{10}$, $\frac{1}{2}$ $\frac{9}{12}$, $\frac{3}{4}$ $\frac{5}{15}$, $\frac{1}{3}$ $\frac{9}{24}$, $\frac{3}{8}$ $\frac{6}{16}$. $\frac{3}{8}$
3. Change to mixed numbers: $\frac{7}{4}$, $1\frac{3}{4}$ $\frac{8}{3}$, $2\frac{2}{3}$ $\frac{10}{4}$, $2\frac{1}{2}$ $\frac{12}{8}$, $1\frac{1}{2}$ $\frac{21}{5}$. $4\frac{1}{5}$
4. It is $12\frac{8}{10}$ mi. to Greenfield and $10\frac{5}{10}$ mi. to Mayfield. How much farther is it to Greenfield than to Mayfield? $2\frac{3}{10}$ mi.
5. Ann practiced $1\frac{1}{4}$ hr. yesterday and $1\frac{1}{4}$ hr. today. How many hours did she practice both days? $2\frac{1}{2}$
6. Bill lives $\frac{7}{8}$ mi. from school and Jack lives $\frac{5}{8}$ mi. from school. How much farther from school does Bill live than Jack? $\frac{1}{4}$ mi.
7. Mother used $3\frac{1}{2}$ cups of flour for rolls and $1\frac{1}{2}$ cups for a cake. How many cups of flour did Mother use? 5
8. Show by writing examples that you know the meaning of each of the following: proper fraction, improper fraction, numerator, denominator, mixed number.

Copy and add. Change fractions in answers to lowest terms: Stress.

9.	$8\frac{4}{5} + 3\frac{4}{5}$ $12\frac{3}{5}$	$3\frac{1}{6} + 3\frac{5}{6}$ 7	$7\frac{2}{5} + 3\frac{2}{5}$ $10\frac{4}{5}$	$9\frac{11}{16} + 4\frac{13}{16}$ $14\frac{1}{2}$
10.	$4\frac{3}{8} + 2\frac{3}{8}$ $6\frac{3}{4}$	$2\frac{3}{4} + 1\frac{3}{4}$ $4\frac{1}{2}$	$1\frac{7}{8} + 6\frac{1}{8}$ 8	$2\frac{5}{12} + 5\frac{5}{12}$ $7\frac{5}{6}$
11.	$1\frac{5}{8} + 6\frac{3}{8}$ 8	$4\frac{2}{3} + 6\frac{2}{3}$ $11\frac{1}{3}$	$8\frac{3}{8} + 2\frac{7}{8}$ $11\frac{1}{4}$	$4\frac{9}{10} + 4\frac{7}{10}$ $9\frac{3}{5}$

Copy and subtract. Change fractions in answers to lowest terms:

12.	$4\frac{5}{6} - 1\frac{1}{6}$ $3\frac{2}{3}$	$9\frac{5}{8} - 6\frac{1}{8}$ $3\frac{1}{2}$	$8\frac{1}{3} - 2\frac{1}{3}$ 6	$8\frac{11}{12} - 5\frac{5}{12}$ $3\frac{1}{2}$
13.	$2\frac{4}{5} - 2\frac{1}{5}$ $\frac{3}{5}$	$4\frac{1}{2} - 1\frac{1}{2}$ 3	$6\frac{7}{8} - 6\frac{3}{8}$ $\frac{1}{2}$	$7\frac{15}{16} - 4\frac{3}{16}$ $3\frac{3}{4}$
14.	$5\frac{7}{8} - 3\frac{4}{8}$ $2\frac{3}{8}$	$5\frac{2}{3} - 4$ $1\frac{2}{3}$	$5\frac{5}{6} - 3\frac{5}{6}$ 2	$3\frac{9}{10} - 2\frac{3}{10}$ $1\frac{3}{5}$

Add or subtract. Watch the signs: Stress.

15. $\begin{array}{r} 2\frac{1}{5} \\ +1\frac{3}{5} \\ \hline 3\frac{4}{5} \end{array}$ $\begin{array}{r} 5\frac{5}{8} \\ -4\frac{3}{8} \\ \hline 1\frac{1}{4} \end{array}$ $\begin{array}{r} 6\frac{9}{10} \\ -2\frac{7}{10} \\ \hline 4\frac{1}{5} \end{array}$ $\begin{array}{r} 2\frac{4}{5} \\ +7\frac{3}{5} \\ \hline 10\frac{2}{5} \end{array}$ $\begin{array}{r} 2\frac{7}{8} \\ -\frac{5}{8} \\ \hline 2\frac{1}{4} \end{array}$ $\begin{array}{r} 3\frac{5}{8} \\ +2\frac{5}{8} \\ \hline 6\frac{1}{4} \end{array}$ $\begin{array}{r} 3\frac{1}{16} \\ +3\frac{1}{16} \\ \hline 6\frac{1}{8} \end{array}$

Group pupils for further review or reteaching. Let others work at arithmetic corner. Keep materials up to date.

A Problem Test

1. The bus trip to Maryland takes $6\frac{3}{4}$ hr. The train trip there takes $5\frac{1}{4}$ hr. How much longer is the bus trip than the train trip? $1\frac{1}{2}$ hr.

2. A truck driver made a trip of 910 mi. at an average speed of 35 mi. an hour. How long did the trip take? 26 hr.

3. Mary Jane bought 3 pears for a quarter. What was the cost of 1 pear? $8\frac{1}{3}$¢

4. The Star Store sold 375 pairs of gloves at $2.95 a pair. How much money did they get for the gloves? $1106.25

5. Jean's dress takes $2\frac{3}{8}$ yd. of cloth and her mother's dress takes $3\frac{7}{8}$ yd. If both dresses are made from the same cloth, how many yards in all are needed? $6\frac{1}{4}$

6. Mr. Brown caught 4 fish that weighed 5 lb. all together. What was the average weight per fish? $1\frac{1}{4}$ lb.

7. Four boys bought a big bag of 125 marbles and shared them equally. How many marbles did each boy get? 31, 1 marble over

8. Bill's weekly marks in arithmetic for the last 4 weeks are 85, 87, 89, 91. Find Bill's average mark in arithmetic for the last 4 weeks. 88

9. Betty bought 3 yd. of silk at $1.69 a yard. She gave the man $6.00 to pay for it. How much change did Betty get? $.93 What is the smallest number of coins she could get? 7

10. Miss Flower's class of 34 children sold 272 tickets to the school's Christmas play. How many tickets, on the average, did each child sell? 8

How many problems did you get right? Did you do better than you did on the last Problem Test?

SCORE	0–5 You need help	6–7 Fair	8–9 Good	10 Excellent

Remind pupils to read problems carefully to determine what the problem asks, what facts are known, what process to use, how to write problem in numbers. Have pupils record their scores on own charts. See pages 43, 73, 107 also.

Present diagnostic test on fractions.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Page for that row.

Change these fractions to lowest terms:

						Practice Pages
1.	$\frac{4}{6}$ $\frac{2}{3}$	$\frac{6}{8}$ $\frac{3}{4}$	$\frac{9}{12}$ $\frac{3}{4}$	$\frac{5}{10}$ $\frac{1}{2}$	$\frac{14}{16}$ $\frac{7}{8}$	115

Change to whole or mixed numbers:

2.	$\frac{7}{4}$ $1\frac{3}{4}$	$\frac{8}{8}$ 1	$\frac{10}{5}$ 2	$\frac{14}{4}$ $3\frac{1}{2}$	$\frac{20}{12}$ $1\frac{2}{3}$	123

Add. Check the work by going over it:

3.	$\begin{array}{r} \frac{3}{5} \\ \frac{1}{5} \\ \hline \frac{4}{5} \end{array}$	$\begin{array}{r} \frac{1}{4} \\ \frac{2}{4} \\ \hline \frac{3}{4} \end{array}$	$\begin{array}{r} \frac{4}{12} \\ \frac{1}{12} \\ \hline \frac{5}{12} \end{array}$	$\begin{array}{r} \frac{2}{10} \\ \frac{7}{10} \\ \hline \frac{9}{10} \end{array}$	$\begin{array}{r} \frac{7}{16} \\ \frac{4}{16} \\ \hline \frac{11}{16} \end{array}$	113
4.	$\begin{array}{r} \frac{1}{6} \\ \frac{3}{6} \\ \hline \frac{2}{3} \end{array}$	$\begin{array}{r} \frac{3}{8} \\ \frac{3}{8} \\ \hline \frac{3}{4} \end{array}$	$\begin{array}{r} \frac{1}{10} \\ \frac{3}{10} \\ \hline \frac{2}{5} \end{array}$	$\begin{array}{r} \frac{5}{16} \\ \frac{9}{16} \\ \hline \frac{7}{8} \end{array}$	$\begin{array}{r} \frac{7}{12} \\ \frac{1}{12} \\ \hline \frac{2}{3} \end{array}$	116
5.	$\begin{array}{r} 1\frac{1}{3} \\ 2\frac{1}{3} \\ \hline 3\frac{2}{3} \end{array}$	$\begin{array}{r} 5\frac{1}{8} \\ 2\frac{3}{8} \\ \hline 7\frac{1}{2} \end{array}$	$\begin{array}{r} 6\frac{3}{16} \\ 4\frac{1}{16} \\ \hline 10\frac{1}{4} \end{array}$	$\begin{array}{r} 4\frac{5}{12} \\ 4\frac{1}{12} \\ \hline 8\frac{1}{2} \end{array}$	$\begin{array}{r} 9\frac{7}{10} \\ 1\frac{1}{10} \\ \hline 10\frac{4}{5} \end{array}$	117
6.	$\begin{array}{r} \frac{7}{8} \\ \frac{1}{8} \\ \hline 1 \end{array}$	$\begin{array}{r} \frac{2}{3} \\ \frac{2}{3} \\ \hline 1\frac{1}{3} \end{array}$	$\begin{array}{r} \frac{7}{10} \\ \frac{3}{10} \\ \hline 1 \end{array}$	$\begin{array}{r} \frac{11}{16} \\ \frac{9}{16} \\ \hline 1\frac{1}{4} \end{array}$	$\begin{array}{r} \frac{11}{12} \\ \frac{7}{12} \\ \hline 1\frac{1}{2} \end{array}$	124
7.	$\begin{array}{r} 6\frac{3}{4} \\ 2\frac{1}{4} \\ \hline 9 \end{array}$	$\begin{array}{r} 4\frac{3}{5} \\ 9\frac{4}{5} \\ \hline 14\frac{2}{5} \end{array}$	$\begin{array}{r} 2\frac{11}{12} \\ 1\frac{11}{12} \\ \hline 4\frac{5}{6} \end{array}$	$\begin{array}{r} 5\frac{7}{10} \\ 2\frac{9}{10} \\ \hline 8\frac{3}{5} \end{array}$	$\begin{array}{r} 1\frac{9}{16} \\ 1\frac{9}{16} \\ \hline 3\frac{1}{8} \end{array}$	125

Subtract. Check the work by going over it:

8.	$\begin{array}{r} \frac{7}{8} \\ \frac{1}{8} \\ \hline \frac{3}{4} \end{array}$	$\begin{array}{r} \frac{4}{5} \\ \frac{1}{5} \\ \hline \frac{3}{5} \end{array}$	$\begin{array}{r} \frac{9}{10} \\ \frac{3}{10} \\ \hline \frac{3}{5} \end{array}$	$\begin{array}{r} \frac{13}{16} \\ \frac{7}{16} \\ \hline \frac{3}{8} \end{array}$	$\begin{array}{r} \frac{11}{12} \\ \frac{7}{12} \\ \hline \frac{1}{3} \end{array}$	119
9.	$\begin{array}{r} 3\frac{3}{4} \\ 2 \\ \hline 1\frac{3}{4} \end{array}$	$\begin{array}{r} 7\frac{5}{6} \\ 1\frac{5}{6} \\ \hline 6 \end{array}$	$\begin{array}{r} 8\frac{11}{16} \\ 5\frac{5}{16} \\ \hline 3\frac{3}{8} \end{array}$	$\begin{array}{r} 4\frac{9}{10} \\ 4\frac{1}{10} \\ \hline \frac{4}{5} \end{array}$	$\begin{array}{r} 2\frac{7}{12} \\ \frac{5}{12} \\ \hline 2\frac{1}{6} \end{array}$	120

Urge pupils who made errors to make self-assignments from practice pages. Try to determine causes of difficulties and reteach, using materials and/or diagrams.

See G-52 for specific aims of Chapter 5.

Chapter 5

Interesting Insects

Correlate problem solving with science and nature lore.

Some insects are friends; other insects are enemies. But all insects are interesting if you study the things they do. No one can tell exactly how many different kinds of insects there are in the world but probably there are many millions of kinds.

1. The cicada spends 17 yr. sleeping under the ground and then comes out to live in the sunshine for only 5 wk. before it dies. How many weeks does the cicada spend under ground? 884 About how many times as many weeks does a cicada spend under ground as it spends above ground? About 177

2. In the South a different kind of cicada spends 13 yr. under ground and 5 wk. above ground. It spends about how many times as much of its life under ground as it spends in the sunshine? About 135

3. The cicada has a little drum head under its wings that it pushes in and out by strong muscles. You can hear it drum $\frac{1}{4}$ mi. away. How many feet is that? 1320

Review measures of time, length, temperature first. Then do problems orally with pupils, letting different ones read problem, another translate it into symbolic language on board, then have class solve it.

Interesting Insects

1. Have you heard a cricket chirping in the garden on a summer evening? A cricket seldom chirps when the temperature rises above 100° or when it drops below 55°. Through how many degrees of temperature does it chirp? 45° (or 46° if 55° is included)

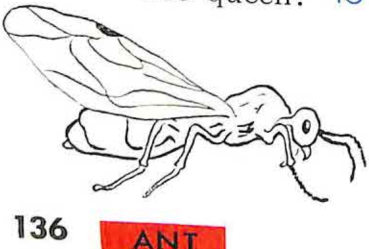
2. Many boys and girls have fun telling the temperature by the cricket's chirp. They count the number of times he chirps in one minute, divide that number by 4, and then add 37. If you do that you will have an answer very close to the real temperature. What will the temperature be when the cricket chirps 80 times in 1 min.? 57° 100 times in 1 min.? 62° 168 times? 79° 212 times? 90°

3. If a cricket chirps only when the temperature is between 55° and 100°, can you figure out the least number of chirps he ever gives in 1 min.? 72 the greatest number? 252

4. Ants keep small insects called "ant cows" which give a sweet milk that ants like. Suppose one "cow" gives 48 drops of milk every 24 hr. How many drops would that be in 1 wk.? 336 in a month of 30 da.? 1440 There are 60 drops in a teaspoon. How many teaspoonfuls of milk would that ant cow give in 1 mo.? 24

5. Suppose some ants kept 15 cows and each cow gave 48 drops of milk each day. How many teaspoonfuls of milk would the ants get each day? 12

6. A bee queen lives about 4 yr.; most ant queens live about 17 yr. A small insect called a termite, which sometimes eats the wood in houses, has a queen that may live as long as 50 yr. The termite queen lives how many more years than the bee queen? 46 how much longer than the ant queen? 33 yr. How many more years does the ant queen live than the bee queen? 13



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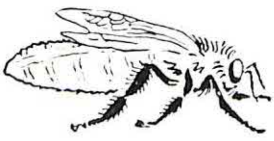
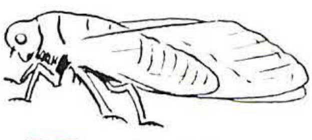


BEE



CICADA

Reteach place value to hundred thousands. See G-53 for discussion of comprehension of quantity of large numbers.

Learning about Large Numbers

1. There are 342 children in the Hilltop School. You read the number 342 like this: **three hundred forty-two.** The number means 3 hundreds, 4 tens, and 2 ones. If you add 300, 40, and 2 you get 342. The number 805 means 8 hundreds, no tens, and 5 ones. Tell what each of these numbers means: 467;(1) 830;(2) 907;(3) 700.(4) (1) 4 hundreds, 6 tens, and 7 ones; (2) 8 hundreds, 3 tens, and 0 ones; (3) 9 hundreds, 0 tens, and 7 ones; (4) 7 hundreds, 0 tens, and 0 ones.

2. Bill's father drove 2475 mi. on a vacation trip. You can read this four-place number in different ways, like this: 2 **thousand,** 4 **hundred,** 75 or 24 **hundred** 75. When it is a house number or a telephone number, it is read **two, four, seven, five.** 2475 means 2 thousands, 4 hundreds, 7 tens, and 5 ones. Read these numbers in two different ways: 2746;(1) 5609;(2) 4005;(3) 6020.(4) (1) 2 thousand, 7 hundred, 46, or 27 hundred 46; (2) 5 thousand, 6 hundred, 9, or 56 hundred 9; see G-53 for (3) and (4).

3. Jane read 2746 as 2 thousand, 7 hundred, and 46. Why was Jane's way wrong? Joe said she should not put **and** in the number. Joe is right. Never use **and** in reading numbers except in a mixed number like $7\frac{1}{2}$. This is read seven **and** one half. Read these numbers in two ways and do not use **and:** 7603;(1) 9162;(2) 3084;(3) 5002;(4) 3891;(5) 3700.(6) Stress. (1) 7 thousand, 6 hundred, 3, or 76 hundred 3; (2) 9 thousand, 1 hundred, 62, or 91 hundred 62; see G-53 for (3)-(6).

4. Last year there were 127,563 people living in Bay City. 127,563 is read 127 **thousand,** 5 **hundred,** 63. You see there is a comma after the thousands. Commas make large numbers easier to read. The figures are marked off by a comma into groups of 3 figures each, beginning at the right. These groups are called **periods.** The names of the periods in a six-place number like 127,563 are **thousands** and **ones.** Stress.

Hundred-Thousands	Ten-Thousands	Thousands	Hundreds	Tens	Ones
1	2	7	5	6	3

Thousands	Ones
127,	563

5. Use commas to mark the periods in the following numbers; then read each number: 47,613; 28,507; 40,507; 30,070: 106,843; 204,060; 700,204; 308,500; 980,075; 903,006. See G-53.

6. Bring to school clippings from the newspaper showing numbers of 5 and 6 figures. Read these numbers. Post on bulletin board.

Let different pupils write numbers on place-value diagram (shown in ex. 4) and have class read them. Stress meaning of numbers, for example, ask pupils how many ten thousands (12 not 2), thousands (127 not 7), and so on, there are in entire number (127,563).

Teach place value to hundred thousands.

More about Large Numbers

1. Joe wrote this number on the blackboard: 180,000,000. He said he read in the paper that there are that many people living in the United States. Can you read the number? Bill said he thought the new period is called **millions.** Miss Black agreed with him. She wrote these numbers on the board and asked the children to read them:

Millions	Thousands	Ones
2,	675,	348
41,	265,	000
165,	000,	000

2. You see that the numbers above have 7, 8, or 9 places and mean **millions.** There are three figures in each period except the left-hand, or millions, period. That period may have only one or two figures. If there are no figures except zeros in a period, do not say that period at all. Joe's number in ex. 1 is read 180 **million.** Read these numbers:

5 million, 732 thousand, 108 — 175 million, 800 thousand, 240

5,732,108 ↙ 28,906,438 ↖ 175,800,240 ↙ 150,000,000 ↘

28 million, 906 thousand, 438 — 150 million

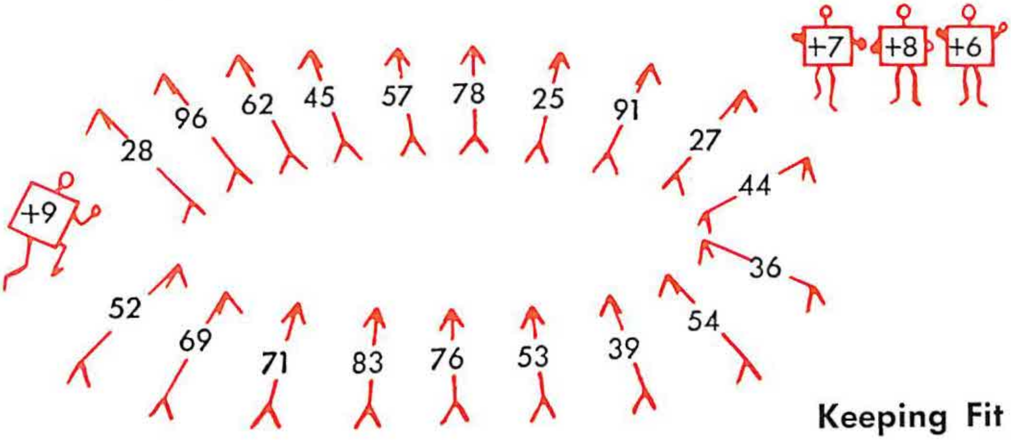
3. Separate these numbers into periods by putting commas in the right places; then read each number: 5,472,186; 83,672,000; 275,910,402; 72,836,907; 53,000,000. See G–54.

Write these numbers with figures:

4. Sixty-two thousand, five hundred forty-one. 62,541
5. Three hundred four million, fifty-six thousand. 304,056,000
6. Eight million, thirty-eight thousand, two hundred. 8,038,200
7. One hundred six million, three thousand, two hundred. 106,003,200
8. Eighty-four million, seven hundred three thousand, five hundred two. 84,703,502
9. Write the largest number you can write with 6 figures. 999,999 Add 1 to it. 1,000,000 Do you have the smallest number you can write with 7 figures? Yes Write the largest number you can write with 9 figures. 999,999,999

Emphasize importance of use of comma in large numbers to facilitate reading of them. Develop understanding that each succeeding place to left is 10 times greater than preceding place (10 is 10 × 1, 100 is 10 × 10, and so on).

Review basic addition skills.



Keeping Fit

1. How fast can you run? Time yourself and see how long it takes you to run the hurdles with each boy. Be careful not to knock a hurdle down. Pupils should add 9 to each number shown as hurdles, then 7, 8, 6. See G-54 for answers.

Add up. Check by adding down:

2.	2	6	3	5	6	7	8	8	4	1
	8	1	8	2	2	1	7	2	9	4
	5	2	1	3	7	2	5	1	3	8
	4	8	6	4	4	5	2	4	8	3
	9	1	7	6	3	6	9	5	1	4
	3	9	9	7	3	3	6	4	7	5
	31	27	34	27	25	24	37	24	32	25

Copy in columns, add, and check:

3. $811.43 + $47.95 + $96.41 + $276.08 $1231.87

4. $57.61 + $830.59 + $77.82 + $420.65 $1386.67

5. $757.49 + $501.55 + $99.07 + $26.65 $1384.76

Try to get the right answers to these addition examples: Remind pupils to insert commas.

6.	2568	21964	17578	17553	53884
	3056	69687	24081	81209	5538
	6732	45996	31954	13988	40464
	2367	10216	64729	2721	43791
	7438	10158	77447	36456	1129
	22,161	158,021	215,789	151,927	144,806

More Practice. See ⑲ on page 317. Use to increase skill.

Children might enjoy doing ex. 1 as contest or game activity. Ex. 2 should be oral also. Note that exercises become more difficult. Try to determine causes of errors (adding by endings, gaps, facts) and drill or review further.

Provide oral review of measures, fractions, facts.

Oral Practice

1. Betsy needs $\frac{3}{4}$ yd. of cloth for a doll dress. She has a piece 30 in. long. Is that enough? $\frac{3}{4}$ yd. = 27 in., yes

2. Mary bought 6 candy bars for 25¢. Bill bought 5 candy bars for 20¢. Who paid more for one candy bar? Bill paid 4¢ for one candy bar, while Mary paid $4\frac{1}{6}$¢. Mary paid more.

3. Think of a number; multiply it by 2; add 6; divide by 2; subtract the number you started with. Is your answer 3? See G-108-111 for other tricks and puzzles.

4. Find the time between 8:25 A.M. and 8:55 A.M. 30 min.

Add the fractions in each pair. Change the answers to lowest terms:

5. $\frac{7}{8}, \frac{1}{8}$ 1 $\quad$ $\frac{5}{6}, \frac{1}{6}$ 1 $\quad$ $\frac{3}{4}, \frac{1}{4}$ 1 $\quad$ $\frac{5}{12}, \frac{1}{12}$ $\frac{1}{2}$ $\quad$ $\frac{13}{16}, \frac{11}{16}$ $1\frac{1}{2}$ $\quad$ $\frac{9}{10}, \frac{1}{10}$ 1

6. $\frac{2}{3}, \frac{1}{3}$ 1 $\quad$ $\frac{5}{8}, \frac{3}{8}$ 1 $\quad$ $\frac{7}{8}, \frac{3}{8}$ $1\frac{1}{4}$ $\quad$ $\frac{7}{16}, \frac{1}{16}$ $\frac{1}{2}$ $\quad$ $\frac{7}{10}, \frac{3}{10}$ 1 $\quad$ $\frac{11}{12}, \frac{7}{12}$ $1\frac{1}{2}$

7. In ex. 5 and 6, subtract the two fractions in each pair. Change answers to lowest terms. Ex.5: $\frac{3}{4}, \frac{2}{3}, \frac{1}{2}, \frac{1}{3}, \frac{1}{8}, \frac{4}{5}$; ex.6: $\frac{1}{3}, \frac{1}{4}, \frac{1}{2}, \frac{3}{8}, \frac{2}{5}, \frac{1}{3}$

8. Try to give the answers to the addition facts on page 5 in 3 min. Try to give the answers to the subtraction facts on page 12 in 3 min. Use the facts on page 5 as multiplication facts and try to give the answers in 3 min. Try to give the answers to the division facts on page 31 in 3 min. See answers on pages 5, 12, 31, and G-15 (page 19, ex. 1) for multiplication facts.

9. Beginning with 13, count by 7's to 62. 13,20,27,34,41,48,55,62

10. Beginning with 15, count by 9's to 78. 15,24,33,42,51,60,69,78

11. Multiply each number by 8 and add 5 to the product:

7 61 $\quad$ 9 77 $\quad$ 0 5 $\quad$ 3 29 $\quad$ 6 53 $\quad$ 4 37 $\quad$ 1 13 $\quad$ 5 45 $\quad$ 2 21 $\quad$ 8 69

12. Multiply each number in ex. 11 by 9 and add 4. 67,85,4,31,58,40,13,49,22,76

Tell what number should go in each space:

13. 6 mo. = $\frac{1}{2}$ yr. $\quad$ $\frac{3}{4}$ yd. = 27 in. $\quad$ 6 pt. = 3 qt.

14. $\frac{1}{4}$ lb. = 4 oz. $\quad$ 3 da. = 72 hr. $\quad$ 1 pk. = 8 qt.

15. 8 oz. = $\frac{1}{2}$ lb. $\quad$ 2 hr. = 120 min. $\quad$ 8 qt. = 1 pk.

16. 9 in. = $\frac{1}{4}$ yd. $\quad$ 8 qt. = 2 gal. $\quad$ 8 pk. = 2 bu.

Plan for remedial work based on class or individual weaknesses as shown by results of review. Urge pupils also to work on their own to correct weaknesses and increase speed.

Present review of all process steps in subtraction.

Time for Practice

Subtract and check:

1.	275	846	937	843	545	842	875
	123	325	236	618	185	396	489
	152	521	701	225	360	446	386
2.	915	507	912	624	900	600	905
	427	359	278	487	568	243	738
	488	148	634	137	332	357	167

3. Tom bought a pair of shoes for $6.25. How much change did he get from a ten-dollar bill? $3.75

4. The United States was born in 1776. How many years old was our country in 1900? 124 in 1955? 179

Try to subtract these without any mistakes:

5.	7936	9473	5372	78273	32625	35519
	5724	8781	4527	39077	27548	29893
	2212	692	845	39,196	5077	5626
6.	9320	8073	9411	75257	35783	92746
	1956	7916	1459	66666	19545	63458
	7364	157	7952	8591	16,238	29,288

7. The Green Valley School promised to raise $275.00 for the Red Cross. At the end of the first week they had $168.25. How much more money did they need? $106.75

8. In the Green Valley School there are 2016 boys and 1984 girls. How many more boys than girls are there? 32

9. Subtract $385.16 from $400.00. $14.84

10. How much more than $218.75 is $325.00? $106.25

11. Find the difference between $832.64 and $285.09. $547.55

12. Ann read the speedometer on her father's car when they started on their vacation this summer. It showed 27,864. When they returned it showed 29,216. How many miles did the family ride on their vacation? 1352

As pupils do ex. 1-12 observe work habits of different children to determine causes of difficulties or hesitation. Group these pupils for further review, stressing meanings. Let others work on arithmetic puzzles, and so on.

Provide oral review of measures, fractions, facts.

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As pupils do ex. 1-12 observe work habits of different children to determine causes of difficulties or hesitation. Group these pupils for further review, stressing meanings. Let others work on arithmetic puzzles, and so on.

Present some two-step problems involving mixed operations.

Problems

1. Bill and his father went fishing. Bill caught a fish weighing $5\frac{3}{4}$ lb. and his father caught one weighing $4\frac{1}{4}$ lb. Bill's fish weighed how many more pounds than his father's? $1\frac{1}{2}$

2. Mrs. Smith took Ann and Jane to the movies. The girls' tickets cost \$.35 each and Mrs. Smith's ticket was \$.65. How much change should Mrs. Smith get from \$2.00? \$.65

3. Miss Black's fifth grade had a party for the fourth grade. It cost \$7.72. Miss Black gave them \$1.00 and they divided the rest of the cost equally among the 32 children in the fifth grade. How much did each one pay? \$.21

4. Jim and his father like to shoot at a mark. On 5 days Jim's scores were 76, 72, 86, 64, and 82. What was his average score for the 5 days? 76

5. Sally needs $6\frac{3}{4}$ yd. of ribbon for her new dress. She has $5\frac{1}{4}$ yd. now. How many more yards must she buy? $1\frac{1}{2}$

6. Sam and Joe rode their bicycles $3\frac{1}{4}$ mi. on Friday and $8\frac{3}{4}$ mi. on Saturday. How far did they ride both days? 12 mi.

7. Jean's Sunday-school class had a bake sale. She baked 5 doz. cookies which they sold at 3¢ each and a large cake which sold for \$1.50. How much did Jean's things bring? \$3.30

8. Mary had \$17.00 in her Christmas savings. She bought 5 yd. of cloth for aprons at \$.68 a yard and 3 boxes of paper at \$1.25 a box. How much money did she have left? \$9.85

9. Our school serves milk to all the boys and girls in grades 1 to 6. There are 256 children in grades 1 to 3 and 208 in grades 4 to 6. If 1 qt. serves 4, how many quarts of milk are needed each day? 116 How many gallons is that? 29 How many gallons of milk are needed each school week? 145

Remind pupils to look for and answer hidden question first, then use this to find answer to problem.

Review basic skills in all four processes.

Keeping in Practice

1. Find the cost of 56 radios at $18.95 each. $1061.20
2. Find the cost of 50 automobiles at $2679 each. $133,950
3. If 22 books cost $19.58, find the cost of one book. $.89
4. How many books at 95¢ each will bring $39.90 in all? 42

Multiply and check the work:

5. 305	819	724	948	105	$12.74
891	304	853	102	403	94
271,755	248,976	617,572	96,696	42,315	$1197.56
6. 524	896	327	617	704	$40.09
706	971	401	617	562	78
369,944	870,016	131,127	380,689	395,648	$3127.02
7. 237	360	635	900	869	$19.89
237	675	203	125	805	62
56,169	243,000	128,905	112,500	699,545	$1233.18

8. Count from 1 to 73 by 2's; by 4's; by 8's. See G-55.

9. Count from 2 to 56 by 3's; by 6's; by 9's. See G-55.

Add these numbers. (1) Then subtract them: (2)

10. 3711	5424	5930	1433	2000
1586	1678	486	869	1984
(1),(2) 5297,2125	7102,3746	6416,5444	2302,564	3984,16
11. 4267	6536	3899	3008	4846
2258	1758	2479	1999	1259
6525,2009	8294,4778	6378,1420	5007,1009	6105,3587

Divide and check. Write R before remainders, if any:

23R10	44R38	31R15	$ .89
12. 62)1436	54)2414	75)2340	31)$27.59
38R42	48	23	$ .47
13. 53)2056	32)1536	83)1909	52)$24.44
39R11	62R12	52	$ .75
14. 82)3209	22)1376	43)2236	84)$63.00
73R49	24	42R60	$ .53
15. 55)4064	81)1944	75)3210	72)$38.16

Note errors and hesitation on progress cards. Use developmental material found on pages related to pupils' difficulties for reteaching. Let pupils who do well on review work on original problems, projects, and so on.

Extend work on reading and writing Roman numerals to include thousands.

Roman Numerals

Miss Black asked her class to tell some places where they had seen numbers written in Roman numerals.

1. George said he saw XIV on the last book in a set of books in the library. What number is that? 14

2. Bill said he saw XXV at the beginning of the last chapter in a big book. Can you read that number? 25

3. Betty said this numeral is on the outside of the school building: MCMLII. It tells the year in which the school was built. Can you read the number? 1952

4. No one in the fifth grade could read the number in ex. 3, so Miss Black said she would tell them how to read such numbers. She said that numbers are written in Roman numerals with these seven letters:

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

5. Miss Black gave them these numerals to study:

XXX = 30 LXX = 70 CC = 200 DC = 600
XL = 40 LXXX = 80 CCC = 300 DCC = 700
L = 50 XC = 90 CD = 400 DCCC = 800
LX = 60 C = 100 D = 500 CM = 900

6. Then Miss Black gave them these rules:

(1) If the letters are the same or if they decrease in value from left to right, add their values:

XXI = 21 CXV = 115 CCV = 205 LXVI = 66

(2) If a letter is on the left of a letter with a larger value, subtract the smaller from the larger:

IV = 4 IX = 9 XL = 40 CXC = 190

7. Study these numerals, using the rules in ex. 6:

XLIV = 44 CCCLX = 360 MCMXX = 1920
XCII = 92 CDXCV = 495 MCDXC = 1490

Emphasize the two rules for Roman numerals (ex. 6). Give pupils other opportunities to apply these rules in reading and writing Roman numerals. Let pupils write sentences using Arabic numbers, for partners to change to Roman ones.

8. Now look at Betty's number, MCMLII. (See ex. 3.) Tell what M stands for; then tell what CM stands for; then LII. Can you read the number now?

▶ 4 is sometimes written IIII; 900 is sometimes written DCCCC.

Write these numbers, using our numerals:

9. CXXVI 126 MMCL 2150 CXL 140 MDCCCCX 1910
10. CXLII 142 LXIV 64 DCC 700 MCDLXVI 1466
11. LXXIX 79 CDXL 440 MDC 1600 MMXLVII 2047
12. CLXVI 166 XLVII 47 DCX 610 MCMLXIX 1969

Write these numbers, using Roman numerals:

13. 47 XLVII 84 LXXXIV 28 XXVIII 496 CDXCVI 1620 MDCXX 1873 MDCCCLXXIII
14. 93 XCIII 76 LXXVI 53 LIII 317 CCCXVII 1845 MDCCCXLV 1949 MCMXLIX

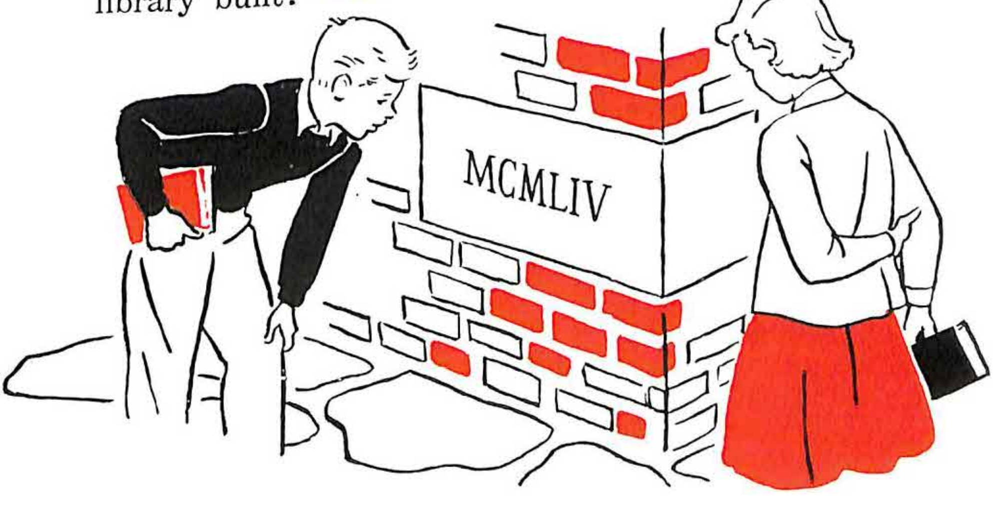
Write the following in Roman numerals:

15. The year you were born; this year and next year.

16. The year America was discovered — 1492. MCDXCII

17. The year the old church was built is marked on a stone "Built MDCCCIV." When was the church built? 1804

18. The library in Forest Hills has this numeral cut on the cornerstone of the building: MCMLIV. In what year was the library built? 1954



Reinforce understanding of our system of writing numbers, number-numeral distinction, meaning and importance of zero, and place value.

Hindu-Arabic Numerals

1. In our system of writing numbers we use ten number symbols, or figures: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. They are called **Arabic** numerals or **Hindu-Arabic** numerals. These numerals were first used in India over 2000 years ago and were brought to Europe by the Arabs. The important thing about our number system is that any number can be represented with these ten symbols. The precise name for any symbol which represents a number is **numeral.** However, we commonly use the word **number** to refer to either a number or a numeral.

2. You will find it interesting to study our way of writing numbers to see why the symbol 0, which we call **zero,** is so important. When 7 is written alone it means 7 **ones** or 7 **units.** If you write a 0 after 7, you have 70 and the 7 now means 7 **tens;** if you write a 0 after 70, you have 700 and the 7 now means 7 **hundreds;** if you write a 0 after 700, you have 7000, and the 7 now means 7 **thousands.**

7 means 7 ones
70 means 7 tens
700 means 7 hundreds
7000 means 7 thousands

3. In ex. 2 you see that each time you write a 0 at the right of the number, the 7 moves one place to the left. We need to use one or more 0's in order to put the 7 into the proper place so that you will know whether it represents 7 **ones,** or 7 **tens,** or 7 **hundreds.** Since the value of the 7, or of any other figure, depends on the place in which it stands, our system of writing numbers is said to have **place value.** Stress.

4. The numbers at the right also show the meaning of place value. In each of these numbers the figure 8 has a different value since it stands in a different place in the number. Tell the value of the 8 in each of these numbers. Also tell the value of the 6 in each of these numbers. (1) 6 hundreds, (2) 6 ones, (3) 6 tens, (4) 6 hundreds

(1) 648 8 ones
(2) 586 8 tens
(3) 863 8 hundreds
(4) 8697 8 thousands

5. In the number 407 the 0 shows that there are **no** tens. We need a symbol to put in the tens place even though there are

Discuss these pages carefully with pupils, demonstrating ex. 2 and 4 on vertical abacus. Emphasize comparison of systems with regard to place value as explained in ex. 7-10.

no tens, for we must keep the 4 in the hundreds place and the 7 in the ones place. When used like this, zero is sometimes called a **place holder.** Stress.

6. Tell what each zero shows in these numbers: 609, 801, 860, 400, 5103, 2089, 3070.

7. The Roman system of writing numbers uses for symbols the seven letters I, V, X, L, C, D, M. There is no symbol in this system for zero.

8. Now study the Roman numerals at the right. The letter V means 5 ones, or 5. If you put the V one place to the left by writing I after it, you have VI but the V still stands for 5; notice that the V does not stand for 50. Now write I after VI, which gives VII; this puts the V one more place to the left but the V is still 5. You see that the value of V does **not** change as its place changes. V is always 5 no matter how many letters you put to the right of it. It is clear that the Roman system does **not** have place value.

V
VI
VII
VIII

9. Here are some numbers in which L is written in 3 different places. Tell the value of L in each of these numbers. 50 Also tell the value of X in each number. 10

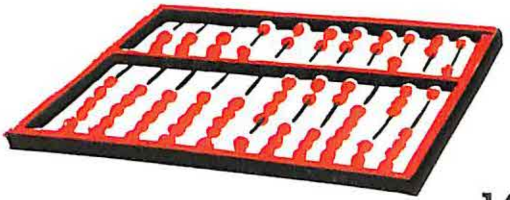
LX
LXI
LXII

10. In our system of writing numbers, it is place value that makes it easy to add numbers as we do, because the **ones** are written under the **ones,** the **tens** under the **tens,** the **hundreds** under the **hundreds,** and so on.

But, as you can see on the right, in the Roman system you cannot add in columns. Since the Roman system does not have place value, the ones are not under the ones, and the tens are not under the tens.

Arabic	Roman
74	LXXIV
507	DVII
29	XXIX

11. The Romans did their computing on an **abacus,** which was made of beads that slide on wires. Today many Chinese compute on an abacus called a **suan pan,** shown at the right.



Review use of parentheses and basic multiplication skills.

Multiplication Warm-up

In ex. 1–3 do the work inside the parentheses first:

1. (8 × 6) + 7 55   (5 × 5) + 3 28   4 + (7 × 5) 39   (4 × 8) + 3 35
2. (9 × 3) + 7 34   (9 × 7) + 8 71   5 + (6 × 8) 53   (7 × 8) + 5 61
3. (7 × 6) + 5 47   (3 × 6) + 2 20   4 + (8 × 8) 68   (6 × 5) + 3 33

4. Find the product of 83 and 65; 5395 of 91 and 24. 2184

5. Find the product of 462 and 249; 115,038 of 96 and 6015. 577,440

6. Find the cost of 50 tickets at $.65 apiece. $32.50

7. What will the school pay for 408 books at $1.96 each? $799.68

Find the products and check your work:

8. 79 × 92 7268   53 × 7294 386,582   452 × 810 366,120   517 × 276 142,692
9. 37 × 76 2812   72 × 2864 206,208   371 × 317 117,607   960 × 916 879,360
10. 80 × 54 4320   90 × 8035 723,150   836 × 483 403,788   295 × 833 245,735
11. 48 × 98 4704   24 × 1354 32,496   249 × 759 188,991   603 × 902 543,906

12. Find the cost of 185 dresses at $7.54 each. $1394.90

13. Mr. Chase sold 851 ball-point pens at $1.59 each. How much did he get for all these pens? $1353.09

Multiply and check your work:

14.	647 519 335,793	276 384 105,984	348 259 90,132	915 230 210,450	7815 56 437,640	3876 48 186,048
15.	348 839 291,972	307 934 286,738	619 204 126,276	867 620 537,540	8025 37 296,925	1548 94 145,512
16.	419 732 306,708	476 329 156,604	637 946 602,602	489 540 264,060	2910 59 171,690	8952 28 250,656
17.	713 827 589,651	592 607 359,344	467 548 255,916	706 730 515,380	2369 85 201,365	2973 69 205,137

Remind pupils to insert decimal points and commas where needed. Help pupils who had errors to analyze causes and plan for remedial work accordingly.

Present two-step problems dealing mainly with business. Be sure pupils estimate answers before computation and label all answers.

Problems

1. Mrs. Hunt paid Jack and Don \$3.50 for shoveling snow for her. After dividing the money equally, Don gave his little sister 25¢. How much money did Don have left? \$1.50

2. Betty was ready to bake cookies which needed an oven of 350°. The temperature in her oven read 275°. How many degrees did it need to rise? 75°

3. Mr. Long made a trip of 344 mi. in 8 hr. What was the average number of miles he drove per hour? 43

4. Mary needs $\frac{3}{4}$ yd. of ribbon. How much will it cost if she pays 24¢ a yard? 18¢ if she pays 40¢ a yard? 30¢

5. Miss Black's fifth grade bought 4 doz. boxes of greeting cards to sell. They paid \$5.40 for each dozen boxes and sold them for \$.75 a box. Three boxes were soiled and could not be sold. How much money did they make? \$12.15

6. May paid 50¢ for 3 cans of corn. What did 1 can cost? $16\frac{2}{3}$¢

7. A train traveled 693 mi. in 11 hr. What was the average speed of the train in miles per hour? 63 mi.

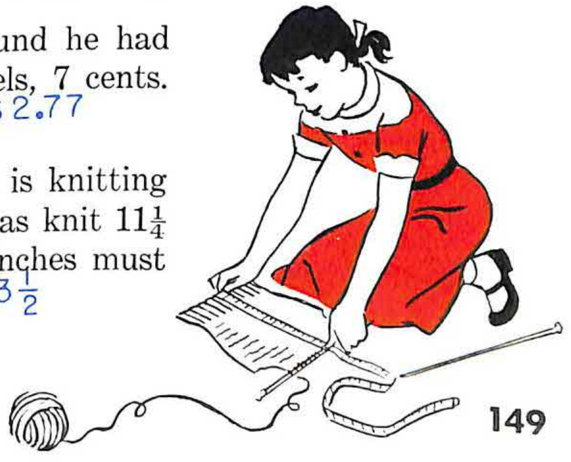
8. Tom's father gives him 75¢ a week. He spends 50¢ a week and saves the rest. In how many weeks can Tom save \$10.00? 40 In how many weeks can he save \$6.75? 27

   ▶ Remember to change \$10.00 to 1000¢ and \$6.75 to 675¢.

9. Mr. Parker pays Jim 75¢ an hour for working in his store after school. Last week Jim worked 2 hr., $2\frac{3}{4}$ hr., $2\frac{1}{4}$ hr., and 1 hr. How much did Jim earn? \$6.00

10. Bill opened his bank and found he had 7 quarters, 3 dimes, 13 nickels, 7 cents. How much money had he? \$2.77

11. The back of the sweater Ann is knitting must be $14\frac{3}{4}$ in. long. She has knit $11\frac{1}{4}$ in. of it. How many more inches must she knit to finish the back? $3\frac{1}{2}$



See page 142 for suggestions.

Reteach rounding off of numbers.

More Round Numbers

1. You have learned that you can round off the number 2974 to the **nearest thousand** and call it 3000, because 2974 is closer to 3000 than it is to 2000. You also know that 8479 rounded off to the nearest thousand is 8000. Can you tell the reason why? Round off these numbers to the nearest thousand: 5286, 7843, 9368, 2799, 4062.
5000 8000 9000 3000 4000

2. Count by hundreds from 100 to 900. Then round off these numbers to the **nearest hundred:** 476, 225, 894, 738.
100,200,300,400,500,600,700,800,900
500 200 900 700

3. Numbers can also be rounded off to the **nearest ten.** Count by tens from 10 to 100. When you round off numbers between 0 and 100 to the nearest ten, you round off to one of the numbers you just used in counting. Suppose you want to round off 19 to the nearest ten. You see that 19 is much closer to 20 than it is to 10. So 19 rounded off to the nearest ten is 20. 41 is between 40 and 50 but much nearer 40 than 50, so 41 rounded off to the nearest ten is 40. Round off 87 to the nearest ten and tell why you think your answer is right. 90, because 87 is nearer to 90 than to 80.
10,20,30,40,50,60,70,80,90,100

4. Round off these numbers to the nearest ten: 38, 21, 57, 84, 62, 49, 93, 76.
40 20 60 80 60 50 90 80

5. Round off these numbers of miles to the nearest ten miles: 59 mi., 32 mi., 26 mi., 88 mi., 67 mi.
60 30 30 90 70

6. Round off these numbers of cents to the nearest ten cents: \$.23, \$.89, \$.47, \$.64, \$.18, \$.36.
\$.20 \$.90 \$.50 \$.60 \$.20 \$.40

7. Suppose you are in a store and want to know how many boxes of bird seed at \$.19 a box you can buy for \$.60. You can round off 19 to 20 and find how many 20's there are in 60 by dividing in your head. How many boxes can you buy? 3 How many can you buy for \$.80? 4

Follow development as given on this page. Give further practice to those who are weak in this skill. See page 4 for other suggestions.

Stress that in estimation we do not use exact numbers from problem, but ones that mean about the same.

Estimating Answers

1. It is important to be able to look over a problem and tell **about** what the answer should be before you start the work. When you find **about** how much the answer should be you are **estimating** the answer. Estimating the answer to a problem before you work it may keep you from making foolish mistakes. Stress.

2. A bus ticket to Long Lake costs \$2.96. How much will it cost for tickets for Bill and his sister Mary? \$5.92

   ▶ Bill did the work as shown at the right. Mary said that could not be right because 1 ticket costs almost \$3.00 and 2 tickets would cost about \$6.00. \$4.92 is about \$5.00. Is Mary right? Yes What was Bill's mistake? Bill forgot to carry the 1 to the hundreds place.

   $$\begin{array}{r} \$2.96 \\ 2 \\ \hline \$4.92 \end{array}$$

3. Mrs. Long spent \$.75 for a pound of butter and \$2.96 for a roast. How much did she spend in all?

   ▶ \$2.96 is about \$3.00, so she spent about \$3.75.

Estimate the answer to each problem. Then work the problem and get the exact answer: Let different pupils explain estimated answers.

4. For each of his 3 boys Mr. King bought a sled at \$5.98 each. How much did the 3 sleds cost? Estimate, \$18.00; exact, \$17.94

5. Mary has \$14.97 in the bank. Jim has \$21.10. How much more has Jim in the bank than Mary? Estimate, \$6.00; exact, \$6.13

6. Four rooms in our school gave \$80.48 to be used in a children's home. What was the average amount given by a room? Estimate, \$20.00; exact, \$20.12

7. At \$1.02 apiece, how much will 40 books cost? Estimate, \$40.00; exact, \$40.80

8. Mr. Hill's electric bill was \$7.96 and his telephone bill was \$11.89. What is the amount of both bills? Estimate, \$20.00; exact, \$19.85

9. Jack wanted a coat that cost \$20.00 and a pair of shoes that cost \$8.00. At a sale he was able to get the coat for \$14.95 and the shoes for \$4.95. How much did Jack save by waiting for the sale? Estimate, \$8.00; exact, \$8.10

Have pupils find out how much more or less exact answer is than estimated answer. Then point out that estimating is quick way to see if answer is sensible.

Estimating Answers

At the end of each problem there are three numbers. Choose the number which you think is nearest the right answer. Then work the problem and compare your answer with the number chosen:

1. Mrs. White bought 31 qt. of milk during March at 19¢ a quart. How much did the milk cost? ($4.00, $5.00, [✓ $6.00]) $5.89
2. Bill's father drove 5982 mi. in 6 mo. What is the average number of miles he drove per month? (900 mi., [✓ 1000 mi.], 9000 mi.) 997 mi.
3. Mrs. Hunt bought 6 yd. of cloth at 95¢ a yard and 4 cards of buttons at 29¢ a card. How much did she spend in all? ($6.00, [✓ $7.00], $8.00) $6.86
4. The lunchroom of the Washington School uses an average of 20 doz. eggs each week. At 49¢ a dozen, how much do the eggs cost? ([✓ $10.00], $11.00, $12.00) $9.80
5. Mrs. White bought two new rugs. One cost $89.50 and the other cost $91.00. How much in all did Mrs. White pay for the two rugs? ($170.00, [✓ $180.00], $190.00) $180.50
6. The Hill family drove to Green Valley for Christmas, a distance of 362 mi. It took them 9 hr. What was the average number of miles they drove per hour? ([✓ 40 mi.], 45 mi., 50 mi.) $40\frac{2}{9}$ mi.
7. Mr. Gray ordered 792 strawberry plants. If he plants them in 8 rows, how many plants will there be in each row? (80 plants, [✓ 100 plants], 120 plants) 99 plants
8. Don bought some meat and groceries for his mother. The meat cost $3.17 and the groceries cost $2.95. How much change should Don get if he gives the man two 5-dollar bills? ([✓ $4.00], $5.00, $6.00) $3.88
9. The girls in Ann's room at school are dressing dolls for the children's home. They figure it costs 24¢ to dress each doll. How much money will they need to have if they want to dress 30 dolls? ($75.00, [✓ $7.50], $9.00) $7.20

Let pupils do problems independently. Have pupils who have difficulty in estimating do their mental computations aloud, to determine causes of difficulties.

Divisors Ending in 6, 7, 8, or 9

1. **Problem** At a sale, socks were selling for 29¢ a pair. Bill had 75¢ left from the money he received for Christmas. How many pairs of socks could he buy? 2

$$\begin{array}{r} 2 \\ 29\overline{)75} \\ \underline{58} \\ 17 \end{array}$$

Explanation You need to find how many 29's there are in 75. You see that 29 is close to 30, so there are about the same number of 29's in 75 as there are 30's in 75. Think of the divisor as 30 instead of 29. To estimate the quotient figure, divide by 3 instead of 2. How many 3's are there in 7? Place 2 in the quotient and multiply 29 by 2. This gives 58. Subtract 58 from 75, which leaves 17. Since 17 is less than 29, 2 is the right quotient. Bill can buy 2 pairs of socks and have 17¢ left.

2. To estimate the quotient in ex. 1 you divided by 3 instead of 2 because 29 is closer to 30 than it is to 20. By what number would you divide to estimate the quotient figure if your divisor were 38, 49, 19, 57, 28, 77, 66?
40 50 20 60 30 80 70

3. Look at the first figure of each divisor in ex. 2 and compare it with the number you divide by to estimate the quotient figure. Can you make a rule for finding the number to divide by when the divisor ends in 6, 7, 8, or 9? When a two-place divisor ends in 6, 7, 8, or 9, divide by one more than the first figure of the divisor to find each quotient figure.

Divide and check. Try to estimate the quotient figure correctly the first time:

4.	3R8 $29\overline{)95}$	1R32 $37\overline{)69}$	2R15 $19\overline{)53}$	1R24 $27\overline{)51}$	2R19 $38\overline{)95}$	1R34 $36\overline{)70}$
5.	2R11 $27\overline{)65}$	1R36 $39\overline{)75}$	2R20 $36\overline{)92}$	2R13 $28\overline{)69}$	3R15 $26\overline{)93}$	2R15 $28\overline{)71}$
6.	1R14 $19\overline{)33}$	3R11 $29\overline{)98}$	2R13 $26\overline{)65}$	3R13 $28\overline{)97}$	1R34 $38\overline{)72}$	2R19 $37\overline{)93}$
7.	3R11 $19\overline{)68}$	1R19 $28\overline{)47}$	3R15 $27\overline{)96}$	2R17 $39\overline{)95}$	1R22 $26\overline{)48}$	1R21 $29\overline{)50}$
8.	1R25 $38\overline{)63}$	2R9 $36\overline{)81}$	4R7 $19\overline{)83}$	2R25 $26\overline{)77}$	2R4 $39\overline{)82}$	2R11 $37\overline{)85}$
9.	4R14 $19\overline{)90}$	1R16 $36\overline{)52}$	3R9 $27\overline{)90}$	2R5 $38\overline{)81}$	2R2 $29\overline{)60}$	3R8 $28\overline{)92}$

Discuss ex. 1-2 with pupils. Give more examples before asking them to make rule in ex. 3. Have pupils do some problems in ex. 4-9 orally to check understanding.

Give practice in division using Rule II (pages 154-155).

More about Division

1. Problem Divide 441 by 58.

Explanation Since 58 is closer to 60 than to 50, divide 44 by 6 to estimate the quotient figure. Think, "There are seven 6's in 44." Place 7 in the quotient. Now multiply 58 by 7. Subtract 406 from 441. Check the remainder to see if it is smaller than the divisor. Is 7 the right quotient figure? Yes

$$\begin{array}{r} 7 \\ 58\overline{)441} \\ \underline{406} \\ 35 \end{array}$$

2. In ex. 1, you divided by 6 because 58 is closer to 60 than it is to 50. Notice that 6 is 1 **more** than the first figure of 58. When you divide by 87, think, "87 is closer to 90 than it is to 80; I will divide by 9." Notice that 9 is 1 **more** than the first figure of 87.

3. By what number do you divide to estimate the quotient figure if the divisor is 69, 58, 76, 47, 29, 36, 48, 67?
70 60 80 50 30 40 50 70

Emphasize.

When a two-figure divisor ends in 6, 7, 8, or 9, divide by 1 more than the first figure of the divisor to estimate each quotient figure.

Divide and check. Divide by 1 more than the first figure of the divisor to estimate the quotient figure:

4. $\overset{8\text{ R}13}{29\overline{)245}}$ $\overset{7\text{ R}32}{48\overline{)368}}$ $\overset{5\text{ R}29}{56\overline{)309}}$ $\overset{6\text{ R}30}{37\overline{)252}}$ $\overset{8\text{ R}37}{76\overline{)645}}$

5. $\overset{4\text{ R}12}{79\overline{)328}}$ $\overset{9\text{ R}32}{47\overline{)455}}$ $\overset{6\text{ R}57}{87\overline{)579}}$ $\overset{5\text{ R}36}{89\overline{)481}}$ $\overset{7\text{ R}40}{57\overline{)439}}$

6. $\overset{9\text{ R}42}{46\overline{)456}}$ $\overset{8\text{ R}25}{38\overline{)329}}$ $\overset{7\text{ R}43}{66\overline{)505}}$ $\overset{8\text{ R}18}{28\overline{)242}}$ $\overset{4\text{ R}20}{68\overline{)292}}$

7. $\overset{6\text{ R}28}{59\overline{)382}}$ $\overset{7\text{ R}54}{88\overline{)670}}$ $\overset{9\text{ R}45}{69\overline{)666}}$ $\overset{9\text{ R}68}{77\overline{)761}}$ $\overset{6\text{ R}40}{56\overline{)376}}$

8. $\overset{5\text{ R}42}{68\overline{)382}}$ $\overset{3\text{ R}79}{87\overline{)340}}$ $\overset{7\text{ R}28}{36\overline{)280}}$ $\overset{3\text{ R}35}{48\overline{)179}}$ $\overset{8\text{ R}28}{39\overline{)340}}$

9. $\overset{7\text{ R}19}{49\overline{)362}}$ $\overset{9\text{ R}33}{58\overline{)555}}$ $\overset{8\text{ R}27}{67\overline{)563}}$ $\overset{4\text{ R}27}{78\overline{)339}}$ $\overset{6\text{ R}75}{86\overline{)591}}$

Give further practice as in ex. 3 to pupils who are still unsure of estimating divisor. Stress also reasons for placement of quotient figures.

Keeping in Practice

1. The 419 children in the New Castle School made a trip to the zoo. The school busses each hold 48 people. How many full busses were there to carry 419 children and 9 teachers to the zoo? 8 How many rode in an extra bus? 44 persons

2. Oranges are 59¢ a dozen. How many dozens can you buy for $2.00? 3 How much change will you get? 23¢

   ▶ Change $2.00 to 200¢.

3. A pilot in a fast plane made a trip of 350 mi. in 49 min. About how many miles did the plane average per minute? 7

4. On a long automobile trip Mr. Field averages about 39 mi. an hour. About how many hours does he need to drive 240 mi.? 6 to drive 160 mi.? 4

5. Divide 250 by 49; 5R5 divide 480 by 79. 6R6

Divide. Check your work by multiplying: Stress.

6.	58)264 4R32	78)250 3R16	87)649 7R40	49)418 8R26	76)443 5R63
7.	57)380 6R38	88)294 3R30	56)497 8R49	29)274 9R13	59)327 5R32
8.	39)270 6R36	57)486 8R30	36)240 6R24	46)259 5R29	67)645 9R42
9.	77)661 8R45	68)249 3R45	89)748 8R36	86)651 7R49	79)500 6R26
10.	66)382 5R52	78)499 6R31	69)296 4R20	38)298 7R32	27)214 7R25
11.	58)372 6R24	37)331 8R35	48)216 4R24	26)181 6R25	28)189 6R21
12.	77)431 5R46	68)528 7R52	88)452 5R12	58)313 5R23	69)525 7R42

Let pupils complete work independently. After checking answers, group those who had errors and help them to analyze causes. Have them do computations orally to check thinking process and understanding.

Extend application of Rule II to 2-figure quotients (pages 156-157).

Two-Place Quotients

1. Problem One shelf in our school library holds an average of 29 story books. How many shelves are needed for the 700 story books in our library? 24, 4 books over

```
   24
29)700
   58
   120
   116
     4
```

Explanation Since 29 is almost 30, there are about as many 29's in 700 as there are 30's in 700. To divide 70 by 29, think, "There are two 3's in 7." Write 2 in the quotient over the 0 of 70. Multiply 29 by 2, which gives 58. Write 58 under 70 and subtract. The remainder is 12, which is less than 29. Bring down the next figure of the dividend.

To get the second quotient figure, think, "There are four 3's in 12." Write 4 in the quotient. Multiply 29 by 4, which gives 116. Write 116 under 120 and subtract. Is the remainder less than the divisor? The quotient is 24 and the remainder is 4. We need 24 shelves for the story books and 4 books have to be placed on another shelf.

Divide and check. Divide by 1 more than the first figure of the divisor to estimate each quotient figure: Stress reasons.

2. 38)541 14R9 — 48)660 13R36 — 78)4846 62R10 — 28)1300 46R12 — 36)1212 33R24

3. 37)860 23R9 — 29)823 28R11 — 59)2082 35R17 — 46)3165 68R37 — 78)1652 21R14

4. 27)720 26R18 — 26)641 24R17 — 37)1393 37R24 — 47)3027 64R19 — 46)1177 25R27

5. 28)681 24R9 — 58)956 16R28 — 39)2190 56R6 — 87)5712 65R57 — 57)1327 23R16

6. 19)485 25R10 — 28)772 27R16 — 27)1534 56R22 — 58)2637 45R27 — 39)1658 42R20

7. 38)851 22R15 — 19)615 32R7 — 57)3740 65R35 — 19)1411 74R5 — 57)4308 75R33

8. 27)936 34R18 — 36)862 23R34 — 66)2222 33R44 — 67)1565 23R24 — 28)1529 54R17

9. 26)900 34R16 — 37)870 23R19 — 88)4679 53R15 — 56)1481 26R25 — 79)4196 53R9

Do ex. 1 carefully with pupils, stressing how to determine estimated divisor and 5 steps used in finding "each" quotient figure. Be sure pupils understand placement of quotient figures.

Practice in Division

1. Last summer Tom picked 49 qt. of berries and sold all of them. At the end of the summer he had \$25.00. About how many cents, on the average, did Tom get per quart?
▶ Change \$25.00 to 2500¢. About 51¢

2. On Saturdays George stocks shelves in a big market. He finds he can put 48 cakes of soap in one row. How many rows will he need for 1540 cakes of soap? 32 How many cakes of soap will be left over? 4

3. For spring games the 730 children in the Field School will be divided into 29 teams. How many children will there be in each team? 25 How many teams will need to have one more child in them? 5

4. Forty-eight children asked to help make arm bands for the different teams. They will need 730 arm bands. How many arm bands will each child have to make? 15 How many will have to make one extra arm band? 10 children

Some of the boys and girls in Miss Black's class did all of the division examples below without making one mistake. Can you do as well?

	34R26	34R42	69R75	23R48	54R23
5.	86)2950	69)2388	86)6009	58)1382	87)4721
	56R33	18R40	36R32	84R30	35R18
6.	76)4289	68)1264	69)2516	58)4902	77)2713
	57R29	57R28	27R8	23R25	58R49
7.	78)4475	67)3847	39)1061	59)1382	86)5037
	65R24	67R19	67R31	65R11	46R19
8.	37)2429	88)5915	87)5860	29)1896	27)1261
	75R5	36R24	94R14	46R24	37R23
9.	49)3680	36)1320	19)1800	26)1220	27)1022
	75R10	68R24	25R39	35R14	96R11
10.	28)2110	48)3288	79)2014	39)1379	19)1835

More Practice. See ⑳ on page 317. Use to give individual help.

Do ex. 1-4 with pupils, then have them complete ex. 5-10 independently. Determine if errors are caused by facts, estimation, placement of quotients, and so on, and reteach accordingly (stress meanings.)

Review measures and introduce new term, gross.

Do You Know These Measures?

1. Last summer Jim visited an old church that was built in 1649. About how many centuries old is this church? 3

2. Mr. Brown says he was born 4 score and 6 years ago. A score is 20 yr. How many years old is Mr. Brown? 86 In what year was he born?

3. When Tom runs around the track on the school playground 8 times he has gone a mile. How many feet is it around the school track? 660

4. Patty knows she should drink at least 3 glasses of milk each day. If she drinks this amount every day in the year, how many quarts of milk does she drink in a year of 365 da.? $273\frac{3}{4}$
▶ One glass is $\frac{1}{2}$ pt. Point out that this refers to standard size glass (8 oz.).

5. Don read that a person should eat 1 egg every day. If the 3 children in Don's family do this, about how many dozen eggs will they eat in a year? 91 1/4 A case of eggs holds 30 doz. eggs. Is 1 egg a day more or less than 1 case of eggs a year? 5 eggs more than a case

6. Pencils are sold to stores by the **gross.** A gross is 12 doz. How many pencils are there in 1 gross? 144 in 3 gross? 432

Tell what number goes in each space below: Do orally.

7. 4 oz. = $\frac{1}{4}$ lb. 1 pt. = $\frac{1}{8}$ gal. $\frac{1}{3}$ yd. = 12 in.
8. 4 pk. = 1 bu. 8 oz. = $\frac{1}{2}$ lb. $\frac{1}{4}$ yr. = 3 mo.
9. 4 in. = $\frac{1}{3}$ ft. $\frac{1}{2}$ mi. = 2640 ft. $\frac{5}{8}$ lb. = 10 oz.
10. 9 in. = $\frac{1}{4}$ yd. $\frac{3}{4}$ hr. = 45 min. $\frac{3}{4}$ ft. = 9 in.
11. 3 bu. = 12 pk. 2 hr. = 120 min. $\frac{3}{4}$ bu. = 24 qt.
12. 6 in. = $\frac{1}{2}$ ft. $\frac{1}{2}$ min. = 30 sec. 3 oz. = $\frac{3}{16}$ lb.
13. 1 da. = $\frac{1}{7}$ wk. 5 min. = $\frac{1}{12}$ hr. $\frac{1}{8}$ mi. = 660 ft.
14. $\frac{1}{4}$ lb. = 4 oz. $\frac{1}{4}$ gal. = 2 pt. $\frac{3}{4}$ T. = 1500 lb.
15. $\frac{1}{2}$ T. = 1000 lb. 3 T. = 6000 lb. $\frac{3}{4}$ bu. = 3 pk.

If pupils have difficulty in changing small units to larger ones, or reverse, demonstrate process, using materials. Stress that answer is smaller when changing from smaller unit to larger one (and reverse).

Three-Place Quotients

1. **Problem** Last summer 49 Boy Scouts collected 5980 lb. of old paper and sold it. How many pounds, on the average, did each boy collect? 122, 2 lb. extra

$$\begin{array}{r} 122 \\ 49\overline{)5980} \\ 49 \\ \hline 108 \\ 98 \\ \hline 100 \\ 98 \\ \hline 2 \end{array}$$

Explanation Since 49 is almost 50, there are about as many 49's in 5980 as there are 50's in 5980. Think, "There is one 5 in 5." Write 1 in the quotient. Multiply 49 by 1, which gives 49. Write 49 under 59 and subtract. The remainder is 10, which is less than 49. Bring down the next figure of the dividend.

To get the second quotient figure, think, "There are two 5's in 10." Write 2 in the quotient. Multiply 49 by 2, which gives 98. Write 98 under 108 and subtract. Is the remainder less than the divisor? Bring down the next figure.

To get the third figure, think, "There are two 5's in 10." Tell how to finish the work. Each boy collected an average of 122 lb. of old paper and there were 2 lb. extra.

2. On a vacation trip the Whites drove 3738 mi. in 21 da. Find the average number of miles they drove per day. 178

3. The Browns were away for 25 da. and drove 4100 mi. in that time. Find the average number of miles they drove per day on that trip. 164

Divide. Check your work: Stress.

4. 5141 ÷ 38 135R11 ✓ 9102 ÷ 74 123 10,735 ÷ 33 325R10 ✓ 15,072 ÷ 32 471 ✓

5. 3600 ÷ 29 124R4 ✓ 5148 ÷ 22 234 21,292 ÷ 29 734R6 ✓ 26,496 ÷ 72 368 ✓

6. 3843 ÷ 21 183 9482 ÷ 39 243R5 ✓ 11,305 ÷ 48 235R25 ✓ 27,592 ÷ 49 563R5 ✓

7. 6996 ÷ 33 212 4690 ÷ 35 134 15,072 ÷ 64 235R32 ✓ 19,004 ÷ 81 234R50 ✓

8. 8084 ÷ 19 425R9 ✓ 8521 ÷ 38 224R9 ✓ 31,691 ÷ 46 688R43 ✓ 12,805 ÷ 36 355R25 ✓

More Practice. See ㉑ on page 317. Use to reinforce skill.

Since new skills are not involved, let pupils proceed independently. Remind pupils of steps in finding "each" quotient figure, in particular the comparison step.

Present problems dealing with winter sports.

Fun in Winter

1. Don and Andy live at Mountain Lake where many people go for winter sports. The boys know how to skate, ski, and sail an iceboat. Snow usually comes by Nov. 1 and stays on the ground until Mar. 31. About how many months is there snow on the ground? 5

2. Last winter the amounts of snow that fell at Mountain Lake during 5 winter months were: Nov., 3 in.; Dec., $4\frac{3}{4}$ in.; Jan., 6 in.; Feb., 9 in.; Mar., $7\frac{1}{4}$ in. What was the average number of inches per month? 6

3. Don's brother has an iceboat on the lake. With a good wind he can sail 1 mi. in 80 sec. How many feet is that per second? 66 How many feet per minute? 3960 Is this about $\frac{1}{2}$ mi. per minute or $\frac{3}{4}$ mi. per minute? $\frac{3}{4}$

4. The bobsled run at Mountain Lake is 2640 yd. long. How many feet long is it? 7920 Is this more or less than 1 mi.? More

5. The boys watched a bobsled with 4 men on it as it came down the run in a race. It went at a speed of a mile in 1 min. 20 sec. How many feet was that per second? 66
   ▶ Change 1 min. 20 sec. to seconds.

6. Don said, "When I grow up I will try to come down the run at a speed of a mile a minute." How many feet per second would that be? 88

Observe pupils as they work and note how they "attack" problems. Have pupils talk out solutions to see if processes, vocabulary, thought patterns cause difficulty.

7. The best speed on the Mountain Lake bobsled run is 22 yd. per second. At that speed, how many minutes does a bobsled take to come down the run? 2 See ex. 4.

8. Don and Andy are too young to use the bobsled run but they can coast down a steep hill. The hill is $\frac{1}{6}$ mi. long and the boys together on a sled can coast down it in $\frac{1}{3}$ min. How many feet is that per second? 44

▶ First change $\frac{1}{6}$ mi. to feet and $\frac{1}{3}$ min. to seconds.

9. Don weighs $84\frac{1}{2}$ lb.; Andy weighs $81\frac{1}{2}$ lb. If they coast together on a sled, how much weight does the sled carry? 166 lb.

10. The boys are good skaters. Yesterday Andy skated across the lake and back in 25 min. but Don took 5 min. longer. How many minutes did Don take? 30 What part of an hour did Don take? $\frac{1}{2}$

11. Last winter during the Christmas holidays the merchants in Mountain Lake offered prizes for the best animals made out of snow and ice. There were 18 prizes as follows: \$10 for the first prize, \$5 for the second prize, \$3 for the third, and 15 prizes of \$1 each. How much money in prizes was offered by the merchants? \$33

Encourage pupils to make up own problems about other kinds of winter sports from their experiences.

Fraction Review

1. Change these fractions to lowest terms: $\frac{4}{6}$, $\frac{2}{3}\frac{6}{8}$, $\frac{3}{4}\frac{12}{16}$, $\frac{3}{4}\frac{10}{12}$, $\frac{5}{6}\frac{8}{12}$, $\frac{2}{3}$ $\frac{6}{10}$, $\frac{3}{5}\frac{9}{12}$, $\frac{3}{4}\frac{4}{16}$, $\frac{1}{4}\frac{10}{16}$, $\frac{5}{8}\frac{18}{24}$. $\frac{3}{4}$

2. Change each fraction to a whole number or a mixed number: $\frac{15}{4}$, $\frac{20}{6}$, $\frac{17}{5}$, $\frac{20}{10}$, $\frac{24}{16}$, $\frac{8}{8}$, $\frac{20}{12}$, $\frac{16}{10}$. $1\frac{3}{5}$

$3\frac{3}{4}$ $3\frac{1}{3}$ $3\frac{2}{5}$ 2 $1\frac{1}{2}$ 1 $1\frac{2}{3}$

3. Does the fraction $\frac{8}{12}$ equal the fraction $\frac{2}{3}$? Yes Why? Because both parts of the fraction can be divided by 4 to get the same value.

4. A year ago Ann weighed $72\frac{1}{4}$ lb. Now she weighs $80\frac{3}{4}$ lb. How many more pounds does Ann weigh this year than last? $8\frac{1}{2}$

5. How many miles are $4\frac{3}{10}$ mi. and $6\frac{3}{10}$ mi.? $10\frac{6}{10}$, or $10\frac{3}{5}$

Add. Check your work by going over it:

6.	$\frac{1}{10}$	$\frac{5}{16}$	$3\frac{3}{8}$	$2\frac{9}{16}$	$5\frac{7}{12}$	$2\frac{5}{6}$	$3\frac{7}{10}$	$2\frac{11}{12}$
	$\frac{7}{10}$	$\frac{7}{16}$	$2\frac{1}{8}$	$2\frac{3}{16}$	$1\frac{1}{12}$	$1\frac{5}{6}$	$2\frac{9}{10}$	$1\frac{5}{12}$
	$\frac{4}{5}$	$\frac{3}{4}$	$5\frac{1}{2}$	$4\frac{3}{4}$	$6\frac{2}{3}$	$4\frac{2}{3}$	$6\frac{3}{5}$	$4\frac{1}{3}$
7.	$\frac{11}{12}$	$\frac{7}{10}$	$5\frac{1}{4}$	$9\frac{5}{12}$	$1\frac{7}{10}$	$4\frac{3}{8}$	$3\frac{9}{16}$	$6\frac{3}{10}$
	$\frac{11}{12}$	$\frac{3}{10}$	$5\frac{3}{4}$	$3\frac{7}{12}$	$4\frac{3}{10}$	$\frac{3}{8}$	$6\frac{11}{16}$	$2\frac{9}{10}$
	$1\frac{5}{6}$	1	11	13	6	$4\frac{3}{4}$	$10\frac{1}{4}$	$9\frac{1}{5}$

8. Mary and Jim walk $\frac{3}{4}$ mi. to get on the school bus. They ride $2\frac{3}{4}$ mi. on the bus. How far do they live from the school? $3\frac{1}{2}$ mi. How far do they ride on the bus each day going to school and back? $5\frac{1}{2}$ mi. How far do they walk each day? $1\frac{1}{2}$ mi.

9. In the meat market Mr. King weighed 2 chickens for Mrs. Smith. One chicken weighed $3\frac{11}{16}$ lb. and the other weighed $3\frac{3}{16}$ lb. How much heavier was one chicken than the other? $\frac{1}{2}$ lb.

Subtract. Check your work by going over it:

10.	$\frac{7}{16}$	$\frac{9}{10}$	$2\frac{3}{4}$	$4\frac{15}{16}$	$2\frac{7}{12}$	$6\frac{7}{8}$	$8\frac{13}{16}$	$7\frac{7}{10}$
	$\frac{3}{16}$	$\frac{3}{10}$	$1\frac{1}{4}$	$2\frac{5}{16}$	$2\frac{1}{12}$	$4\frac{3}{8}$	$1\frac{7}{16}$	$5\frac{1}{10}$
	$\frac{1}{4}$	$\frac{3}{5}$	$1\frac{1}{2}$	$2\frac{5}{8}$	$\frac{1}{2}$	$2\frac{1}{2}$	$7\frac{3}{8}$	$2\frac{3}{5}$
11.	$\frac{7}{12}$	$\frac{7}{10}$	$2\frac{5}{6}$	$4\frac{11}{12}$	$8\frac{9}{10}$	$4\frac{4}{5}$	$6\frac{7}{12}$	$1\frac{13}{16}$
	$\frac{3}{12}$	$\frac{3}{10}$	$\frac{1}{6}$	$3\frac{1}{12}$	$5\frac{1}{10}$	$2\frac{1}{5}$	$4\frac{5}{12}$	$\frac{3}{16}$
	$\frac{1}{3}$	$\frac{2}{5}$	$2\frac{2}{3}$	$1\frac{5}{6}$	$3\frac{4}{5}$	$2\frac{3}{5}$	$2\frac{1}{6}$	$1\frac{5}{8}$

Use review as diagnostic test of pupils' ability to work with fractions. Plan remedial activities based on results. This work should be mastered before beginning new work.

Magic Squares

1–3. In each square add each row, each column, and the numbers from corner to corner as you did on page 26. Is each square a magic square? Yes

1.

302	218	278
242	266	290
254	314	230

Sums: 798

2.

94	157	112
139	121	103
130	85	148

363

3.

555	571	491
475	539	603
587	507	523

1617

4–9. Find the missing numbers in each square below that will make it a magic square. First find what each sum should be. Be sure to test your final square.

4.

314	282	442
474	346	218
250	410	378

Sums: 1038

5.

631	722	657
696	670	644
683	618	709

2010

6.

667	743	363
287	591	895
819	439	515

1773

7.

457	992	243
350	564	778
885	136	671

Sums: 1692

8.

832	643	778
697	751	805
724	859	670

2253

9.

522	409	974
1087	635	183
296	861	748

1905

10. Make a new square in which the numbers are each 38 less than the numbers in the square in ex. 1. Is this new square a magic square? Yes, with sum of 684

This activity is for enjoyment only. Do not attempt to secure mastery of this work by all pupils. See page 26 for other suggestions.

Dividing Dollars and Cents

1. Problem During January Mrs. Lane spent $85.05 for food for her family. What was the average cost of food per day? $2.74

$$\begin{array}{r} \$2.74 \\ 31\overline{)\$85.05} \\ \underline{62} \\ 23\,0 \\ \underline{21\,7} \\ 1\,35 \\ \underline{1\,24} \\ 11 \end{array}$$

Explanation You divide by 31 since there are 31 days in January. You divide dollars and cents just as you divide any other numbers. Be Stress sure to place the decimal point in the quotient above the decimal point in the dividend. The quotient is $2.74 and the remainder is 11¢. Mrs. Lane spent about $2.74 a day for food. Stress Check by multiplying $2.74 by 31 and adding the remaining 11¢.

2. Mrs. Lane spent $75.48 for milk last year. What was the average amount she spent per month? $6.29

3. Last year Mr. Lane spent $146.76 for gas for his car. What was the average cost of his gas per month? $12.23

4. The Lane boys keep chickens. During February they sold $35.10 worth of eggs. About how much does that average per day? Count 28 days for February. $1.25 R $.10, or about $1.25

Review Rules I (page 85) and II (page 154) first.

Divide and check. First decide whether to divide by the first figure of the divisor or by 1 more than the first figure: Emphasize.

5.	$2.76 32)$88.32	$1.44 R16¢ 65)$93.76	$4.82 R2¢ 82)$395.26	$6.22 R7¢ 74)$460.35
6.	$1.22 73)$89.06	$2.77 R21¢ 27)$75.00	$7.27 R27¢ 58)$421.93	$5.41 R11¢ 43)$232.74
7.	$3.14 24)$75.36	$2.55 R36¢ 37)$94.71	$7.36 R19¢ 77)$566.91	$3.74 R12¢ 39)$145.98
8.	$2.34 R17¢ 26)$61.01	$2.19 R10¢ 29)$63.61	$8.64 R11¢ 62)$535.79	$3.24 R7¢ 49)$158.83
9.	$1.17 R9¢ 44)$51.57	$2.35 R13¢ 28)$65.93	$2.45 85)$208.25	$8.42 R9¢ 57)$480.03
10.	$1.24 R3¢ 74)$91.79	$1.15 41)$47.15	$5.43 32)$173.76	$3.56 R33¢ 46)$164.09
11.	$2.65 33)$87.45	$1.86 52)$96.72	$7.28 84)$611.52	$9.53 71)$676.63

In discussion of ex. 1, stress proper placement of quotient figures, in particular, first figure. Ask pupils why "2" in quotient is written over "5" in dividend and not "8." Have pupils explain first few examples orally.

Present timed tests on the four basic operations.

Testing Your Skill

Addition Test

Add. Write the answers on folded paper: Time: 4 min.

1. 756 203 845 386 134 979 3303	587 273 242 498 131 168 1899	487 184 215 574 432 246 2138	180 256 365 259 338 404 1802	393 766 796 205 967 457 3584	156 297 888 145 496 124 2106

Subtraction Test

Subtract. Write the answers on folded paper: Time: 3 min.

2. 66798 52632 14,166	12000 2086 9914	55964 14588 41,376	50044 36575 13,469
3. 40333 34386 5947	91142 32515 58,627	15349 7699 7650	49000 46175 2825

Multiplication Test

Copy and multiply: Time: 6 min. after copying.*

4. 2509 57 143,013	1395 83 115,785	2037 19 38,703	2470 35 86,450
5. 4518 16 72,288	1386 74 102,564	4059 29 117,711	3762 62 233,244

Division Test

Copy and divide: Time: 5 min. after copying.*

97R15 **6.** 28)2731	43R25 57)2476	87R10 29)2533	83R12 39)3249
43R19 **7.** 56)2427	35R17 38)1347	76R25 46)3521	56R27 37)2099

* In the multiplication and division tests, copy all the exercises on a sheet of paper before taking the test. In copying, spread the exercises over the sheet to allow space for the work. See page 328.

Compare results of tests with previous ones (pages 71, 103, 131). Note weaknesses and improvements on progress cards. Work with pupils who had errors to help them analyze causes. Reteach where needed, stressing meanings.

Teach how to correct quotient figures when Rule II is used (pages 166-167). See G-62 for discussion.

Watching the Remainder

1. **Problem** John's father will take him on a trip of 345 mi. His father averages 38 mi. an hour when he drives his car on a long trip. How many hours do they need for the trip? 9

Explanation Since the divisor is 38, divide by 4 to estimate the quotient figure. Think, "There are eight 4's in 34." Write 8 in the quotient, as shown in A. Multiply 38 by 8, which gives 304, and subtract it from 345. The remainder is 41. Since 41 is **larger** than 38, you see that 38 will go into 345 one more time. This means that the quotient figure 8 is too small.

Try 9 as a quotient figure, as shown in B. This gives a remainder of 3, which is less than 38, so 9 is the right quotient. **The remainder must always be smaller than the divisor.** Stress.

A

$$\begin{array}{r} 8 \\ 38\overline{)345} \\ \underline{304} \\ 41 \end{array}$$

B

$$\begin{array}{r} 9 \\ 38\overline{)345} \\ \underline{342} \\ 3 \end{array}$$

Emphasize.

When the remainder is equal to or larger than the divisor, make the quotient figure 1 larger.

Divide and check. To get the quotient figures, divide by 1 more than the first figure of the divisor:

2.	8R3 28)227	9 46)414	7R8 67)477	6R3 39)237	6R6 47)288
3.	8R3 59)475	5R14 77)399	9R4 86)778	8R4 19)156	8R2 56)450
4.	6R7 27)169	7R4 38)270	6R2 49)296	7R15 87)624	6R1 29)175
5.	7 78)546	6R6 47)288	8R3 29)235	6R10 58)358	8R3 69)555
6.	8R3 66)531	7R9 57)408	9R7 26)241	6 37)222	9R14 56)518
7.	6R5 79)479	7R5 68)481	7 36)252	5R1 48)241	6 76)456

Discuss ex. 1 carefully with pupils, emphasizing "why" quotient is corrected when remainder is larger than divisor. Let different pupils explain work in ex. 2-7 at board.

1. Mr. West sells 48 candy bars for $3.84. How much is that for 1 candy bar? $.08

2. Miss Black's fifth grade is planning an Easter party for the children at the children's home. The girls are to make cupcakes. They can get 27 cupcakes out of each box of cake mix they use. If they need 108 cupcakes, how many boxes of cake mix do they need? 4

3. Jane will tie ribbon on some Easter baskets. She needs 19 in. for each basket. How many baskets can she tie with $4\frac{3}{4}$ yd. of ribbon? Ann told her that $4\frac{3}{4}$ yd. of ribbon is the same as 171 in. How did Ann figure that? 4 yd. = 4 x 36 in. = 144 in., $\frac{3}{4}$ x 36 in. = 27 in., 144 in. + 27 in., = 171 in. ÷ 19 in. = 9 (baskets)

4. The boys will color Easter eggs. They need 108 eggs and there are 18 boys. How many eggs should each boy color? 6

Divide and check. Be sure to check your remainder to see that your quotient figure is correct: Emphasize.

5.	36)335 9R11	57)342 6	78)476 6R8	58)298 5R8	39)319 8R7
6.	48)240 5	59)358 6R4	88)625 7R9	37)296 8	46)435 9R21
7.	89)712 8	26)227 8R19	38)237 6R9	89)534 6	77)555 7R16
8.	27)216 8	49)392 8	86)616 7R14	46)280 6R4	47)435 9R12
9.	49)294 6	58)470 8R6	68)340 5	66)404 6R8	77)709 9R16
10.	67)340 5R5	79)632 8	87)700 8R4	56)348 6R12	78)635 8R11

11. Peter's baby brother weighs 19 lb. Peter weighs 76 lb. Peter weighs how many times as much as his brother? 4

12. On a trip the Bicycle Club rode 152 mi. in 19 hr. What was their average number of miles per hour? 8

More Practice. See ㉒ on page 318.

Do ex. 1-4 and 11-12 with pupils. Have them complete ex. 5-10 independently. Try to determine if estimation of quotients, basic facts, or process steps cause difficulty. Group pupils for further practice or drill.

Provide practice in correcting 2-figure and 3-figure quotients when Rule II is used.

How Many Yards Do They Need?

1. **Problem** The girls in Miss Hunt's class will make white aprons for girls who serve in the lunchroom. Each one of the 24 girls will make 2 aprons. It takes 78 in. of cloth for 2 aprons. The girls are figuring the number of yards of cloth to buy. Ann multiplied 78 in. by 24 and got 1872 in. Then she divided 1872 in. by 36 in. to find the number of yards. How many yards do the girls need? 52

$$\begin{array}{r} 52 \\ 36\overline{)1872} \\ \underline{180} \\ 72 \\ \underline{72} \end{array}$$

Explanation Ann thought, "Since the divisor 36 ends in 6, I will divide by 4. There are four 4's in 18, so 4 is the first quotient figure." But when Ann used 4 for the quotient she got a remainder of 43. Then she knew that 4 was too small because 43 is larger than 36. She changed 4 to 5 and went on with the work. Why is 5 right? Tell how to finish the work. The quotient is 52. So the girls need 52 yd. of cloth.

2. The girls bought 52 yd. of cloth and paid $.60 a yard for it. They made 48 aprons from this cloth. What was the cost of each apron? $.65

3. How many yards of cloth will 18 girls need if each girl uses 78 in. of cloth? 39

In ex. 1 be sure pupils understand why "5" is right, and reasons for placement of quotient figures. In ex. 2–6 let different pupils read the problems, show them in numerical form on board, then let class complete solution.

4. Suppose 18 girls buy 39 yd. of cloth to make 2 aprons apiece. They pay $.48 a yard for the cloth. What will be the cost of each one of the 36 aprons they make? $.52

5. Suppose 27 girls each use 88 in. of cloth for two aprons. How many yards of cloth do they need in all? 66

6. Find the cost of 66 yd. of cloth at $.63 a yard. If 54 aprons can be made of this cloth, what is the cost of each apron? $.77

`Have slower pupils do ex. 7-17 with you, to determine if`

Divide. Check your work by multiplying: `process is understood.`

7. 3858 ÷ 47 82R4 2793 ÷ 19 147 3420 ÷ 36 95 41,616 ÷ 56 743R8
8. 1976 ÷ 38 52 2576 ÷ 46 56 2697 ÷ 29 93 17,712 ÷ 27 656
9. 4791 ÷ 76 63R3 3659 ÷ 57 64R11 1674 ÷ 27 62 17,376 ÷ 48 362
10. 2088 ÷ 29 72 2479 ÷ 37 67 3984 ÷ 48 83 12,636 ÷ 26 486
11. 1166 ÷ 27 43R5 2714 ÷ 59 46 1799 ÷ 29 62R1 16,688 ÷ 28 596
12. 5925 ÷ 79 75 5418 ÷ 86 63 1944 ÷ 36 54 62,283 ÷ 86 724R19
13. 4891 ÷ 67 73 2418 ÷ 39 62 1456 ÷ 28 52 34,129 ÷ 66 517R7
14. 5187 ÷ 19 273 4465 ÷ 47 95 2394 ÷ 38 63 39,381 ÷ 76 518R13
15. 2368 ÷ 37 64 3584 ÷ 56 64 3596 ÷ 58 62 13,832 ÷ 26 532
16. Divide by 26: 1352 52 2184 84 1950 75 2522 97 1404 54
17. Divide by 28: 1792 64 2352 84 2296 82 2184 78 1885 67R9

More Practice. See ㉓ on page 318.

Do You Know the Right Word?

Below each sentence are words or groups of words. Choose the right word or words to complete the sentence:

1. In $30 \times 43 = 1290$, 30 is called the multiplier

quotient divisor multiplier

2. The 6 of $\frac{5}{6}$ is called the denominator

denominator numerator fraction

3. $3\frac{1}{2}$ is called a mixed number

proper fraction mixed number term

4. The fraction $\frac{15}{4}$ is an improper fraction

an improper fraction a proper fraction

5. When you divide 1675 by 25, the answer that you get is called the quotient

divisor product quotient

6. When you add 7, 10, 13, and 18 and divide the sum by 4, your answer is called the average

difference average product

Problems without Numbers

7. You know the cost of hiring a bus and the number of children who will share the cost. How can you find the amount each child should pay?

Divide the cost by the number of children.

8. You know the number of children in each room in the Green Valley School. How can you find the number of all the children in the school?

Add the number of children in all the rooms.

9. You know the price of each of two bicycles you looked at in a store. How can you find the difference in their prices?

Subtract the lower price from the higher price.

10. You know the cost of a yard of cotton cloth and the number of yards needed for a dress. How can you find the cost of all the cloth for that dress?

Multiply the cost of 1 yard by the number of yards.

Extend review in ex. 1–6 by having pupils write similar sentences, in which remaining words should be used, for partners or class to solve. Use of numbers in ex. 7–10 may help slower pupils see process to be used.

Zero in the Quotient

1. Study the two division examples below. Each example is worked both the long way and the short way:

A. Long Way

$$\begin{array}{r} 380 \\ 29\overline{)11020} \\ \underline{87} \\ 232 \\ \underline{232} \\ 0 \\ \underline{0} \end{array}$$

B. Short Way

$$\begin{array}{r} 380 \\ 29\overline{)11020} \\ \underline{87} \\ 232 \\ \underline{232} \\ 0 \end{array}$$

C. Long Way

$$\begin{array}{r} 470 \\ 44\overline{)20687} \\ \underline{176} \\ 308 \\ \underline{308} \\ 7 \\ \underline{0} \\ 7 \end{array}$$

D. Short Way

$$\begin{array}{r} 470 \\ 44\overline{)20687} \\ \underline{176} \\ 308 \\ \underline{308} \\ 7 \end{array}$$

In A, you find the first two figures of the quotient in the usual way. When you subtract 232 from 232, there is no remainder, but the work is not finished because there is a 0 in the dividend still to be brought down. Bring down the 0. Stress. Then divide 0 by 29, which gives 0; write this 0 in the quotient. Complete the work by taking these final steps: (a) Multiply 29 by 0, which gives 0. (b) Subtract 0 from 0, which leaves no remainder. The work is finished because all the figures have been brought down.

In B, the first part of the work is the same as in A but the final steps (a) and (b), shown above, are left out.

2. How is the work in D different from the work in C? The final steps are left out. ✓

Do ex. 3–4 with pupils, using long and short ways, discussing work as in ex. 1. Have pupils use short way in ex. 5–7.

Divide and check:

3. 8883 ÷ 74 120R3 ✓ 9727 ÷ 27 360R7 ✓ 16,104 ÷ 35 460R4 ✓ 25,542 ÷ 69 370R12 ✓

4. 8386 ÷ 27 310R16 ✓ 9385 ÷ 36 260R25 ✓ 30,240 ÷ 54 560 32,694 ÷ 43 760R14 ✓

5. 3523 ÷ 25 140R23 ✓ 8174 ÷ 19 430R4 ✓ 15,120 ÷ 27 560 37,843 ÷ 44 860R3 ✓

6. 8938 ÷ 19 470R8 ✓ 8000 ÷ 32 250 15,400 ÷ 55 280 30,688 ÷ 59 520R8 ✓

7. 8740 ÷ 38 230 7800 ÷ 41 190R10 ✓ 13,115 ÷ 57 230R5 ✓ 64,080 ÷ 72 890

More Practice. See ㉔ on page 318. Use to reinforce understanding

Put examples in ex. 1 on board. Discuss them with pupils, pointing out differences between long and short forms. Ask pupils why zero is needed in ones place. When differences are understood, pupils should use short way.

Oral Practice

1. Mary Jane bought $\frac{1}{4}$ yd. of ribbon. How many inches of ribbon did she buy? 9

2. A box of cookies is marked 12 oz. What part of a pound is that? $\frac{3}{4}$

3. School is out at 3:50 P.M. Ann's bus leaves at 4:15 P.M. How long must she wait for her bus? 25 min.

4. How much will $\frac{3}{4}$ yd. of ribbon cost at 40¢ a yard? 30¢

5. Find the average of 4, 6, 3, and 7. 5

6. How many eggs are there in $\frac{3}{4}$ doz.? 9

7. How much should Mrs. White pay for 12 oz. of meat that sells at 60¢ a pound? 45¢

8. Mrs. Parks bought $5\frac{3}{4}$ yd. of toweling at a sale. She used $1\frac{1}{4}$ yd. of it. How much was left in the piece? $4\frac{1}{2}$ yd.

9. Bill worked $1\frac{3}{4}$ hr. on Friday and $3\frac{1}{4}$ hr. on Saturday. How long did he work in the two days? 5 hr. At 60¢ an hour, how much did Bill earn? $3.00

Give the answers:

10. (8 × 7) + 4 60 2 + (3 × 8) 26 (9 × 6) + 8 62 3 + (4 × 5) 23

11. (7 × 6) + 5 47 1 + (2 × 9) 19 (5 × 9) + 4 49 4 + (6 × 8) 52

12. Read these numbers:

XL 40 CM 900 DCIX 609 MDCL 1650 XIX 19 MCMLXVII 1967

13. Tell how to write these numbers in Roman numerals:

38 XXXVIII 46 XLVI 54 LIV 360 CCCLX 1776 MDCCLXXVI 2500 MMD 1958 MCMLVIII

In ex. 14 and 15, add 8 to each number. (1) Add 9: (2)

(1) 66 97 40 67 88 53 82 61

(2) **14.** 58 67 89 98 32 41 59 68 80 89 45 54 74 83 53 62

44 99 85 43 37 23 71 95

15. 36 45 91 100 77 86 35 44 29 38 15 24 63 72 87 96

Use this review to spot-check for class or individual weaknesses. Let different pupils act as teacher for ex. 10-15. Provide more exercises like ex. 10, 11, 14, 15, in quiz program activity.

Zero in the Quotient

1. The work below shows the long way and the short way to divide when there is a zero in the middle of the quotient:

A. Long Way

$$\begin{array}{r} 407\\ 63\overline{)25641}\\ \underline{252}\\ 44\\ \underline{0}\\ 441\\ \underline{441} \end{array}$$

B. Short Way

$$\begin{array}{r} 407\\ 63\overline{)25641}\\ \underline{252}\\ 441\\ \underline{441} \end{array}$$

C. Long Way

$$\begin{array}{r} 503\\ 38\overline{)19114}\\ \underline{190}\\ 11\\ \underline{0}\\ 114\\ \underline{114} \end{array}$$

D. Short Way

$$\begin{array}{r} 503\\ 38\overline{)19114}\\ \underline{190}\\ 114\\ \underline{114} \end{array}$$

In A, when you start to get the second quotient figure, you see that 44 is less than 63, so you write 0 in the quotient. Your next steps are as follows: (a) Multiply 63 by 0, which gives 0. (b) Write 0 under 44 and subtract, which leaves 44. (c) Bring down the 1, which gives 441 as a new partial dividend. Finish the work as usual.

In B, you leave out steps (a) and (b) and bring down the 1 at once. The work is finished because all the figures of the dividend have been brought down.

2. How is the work in D different from that in C? Steps (a) and (b) are left out.

Divide and check:

3.	47,821 ÷ 68 703R17	21,738 ÷ 31 701R7	26,574 ÷ 86 309
4.	11,533 ÷ 19 607	16,770 ÷ 41 409R1	15,834 ÷ 39 406
5.	30,315 ÷ 43 705	26,676 ÷ 38 702	31,408 ÷ 52 604
6.	29,680 ÷ 59 503R3	13,239 ÷ 33 401R6	25,284 ÷ 28 903
7.	32,549 ÷ 36 904R5	17,633 ÷ 25 705R8	13,975 ÷ 23 607R14
8.	28,908 ÷ 36 803	20,092 ÷ 65 309R7	27,146 ÷ 45 603R11
9.	20,427 ÷ 29 704R11	28,944 ÷ 48 603	36,320 ÷ 89 408R8

More Practice. See ㉕ on page 318.

Follow procedure as for page 171. Be sure pupils understand why zero is needed in tens place (shows that tens have been divided). Have different pupils explain use of long and short forms in ex. 3-4.

Present suggestions for using divisors 13 to 19 (pages 174-175).

Some Troublesome Divisors

1. When the divisors 13 to 19 are used, you often need to correct the quotient figures several times before you find the right one. Here are two ways to save yourself some work:

(1) When you divide by 13, 14, or 15, do not follow the rule on page 85 since you will need to correct the quotient figure too many times. It is better to estimate the quotient figure as closely as you can and then multiply and subtract to see if your estimate is right. Remember that the **remainder will be less than the divisor if the quotient figure is right.** Emphasize.

(2) When you divide by 16, 17, 18, or 19, estimate each quotient figure by dividing by 2. See the rule on page 154. Also see the note at the bottom of this page.

2. In dividing 407 by 14, suppose you try 4 as the first quotient figure, as shown in A. Why is 4 too large?

A.
$$\begin{array}{r} 4 \\ 14\overline{)407} \\ \underline{56} \end{array}$$

B.
$$\begin{array}{r} 3 \\ 14\overline{)407} \\ \underline{42} \end{array}$$

C.
$$\begin{array}{r} 2 \\ 14\overline{)407} \\ \underline{28} \\ 12 \end{array}$$

Then try 3, as in B. Why is 3 wrong? Then try 2, as in C. Why is 2 right? Finish the work in C.

3. In dividing 149 by 16, each quotient figure is estimated by dividing by 2. Dividing 14 by 2, you get 7 for the quotient, as shown in A. Why is 7 wrong? Tell why B is wrong and why C is right.

A.
$$\begin{array}{r} 7 \\ 16\overline{)149} \\ \underline{112} \\ 37 \end{array}$$

B.
$$\begin{array}{r} 8 \\ 16\overline{)149} \\ \underline{128} \\ 21 \end{array}$$

C.
$$\begin{array}{r} 9 \\ 16\overline{)149} \\ \underline{144} \\ 5 \end{array}$$

To the Teacher. For the divisors 16 and 17, the quotient figure found by dividing by 2 may need to be corrected once, or at most twice, to get the right quotient figure. For the divisors 18 and 19, no more than one correction is needed.

In discussing ex. 1, contrast number of corrections needed, if Rule I were used, with those needed when using suggestion (1). Also note that Rule II still applies for divisors 16 to 19. Discuss ex. 2-3 carefully with pupils.

Divisors 13 to 19

1. Problem In the next 18 wk. Jim wants to save \$12.25. What is the average amount he should try to save per week? \$.69

Explanation You estimate each quotient figure by dividing by 2. You get 6 for the first quotient figure and 6 is right. You get 7 for the second quotient figure but that is wrong. How many times did you have to correct the second quotient figure? The quotient is \$.68 and there is a remainder of 1¢. What does the remainder mean?

$$\begin{array}{r} \$.68 \\ 18\overline{)\$12.25} \\ 10\,8 \\ \hline 1\,45 \\ 1\,44 \\ \hline 1 \end{array}$$

2. If Jim should try to save \$12.25 in 17 wk., what is the average amount he would have to save per week? \$.72

Divide. Check your work by multiplying. Stress.

3.	19)513 27	15)1440 96	16)1024 64	17)1139 67	18)1062 59
4.	13)312 24	19)1805 95	14)1330 95	15)1275 85	13)1105 85
5.	14)630 45	16)1477 92 R5	18)1165 64 R13	13)1290 99 R3	17)1445 85
6.	15)720 48	14)1372 98	19)1691 89	18)1234 68 R10	16)1552 97
7.	17)493 29	18)1751 97 R5	13)1157 89	19)1501 79	14)1225 87 R7
8.	19)674 35 R9	15)1477 98 R7	16)1344 84	17)7854 462	15)1281 85 R6

9. How many boxes of bird seed at 19¢ each can Susan buy for \$2.28? 12 for \$2.85? 15

▶ Change \$2.28 and \$2.85 to cents.

10. Divide by 19: 893 47 1034 54 R8 1875 98 R13 6232 328

11. Divide by 14: 784 56 1064 76 1163 83 R1 3962 283

12. Divide by 17: 425 25 1300 76 R8 1520 89 R7 1640 96 R8

More Practice. See ㉖ on page 319. Use to reinforce skill of estimating quotient figures.

Have pupils explain at blackboard how they estimated some quotient figures in ex. 3-12. Remind them that the remainder must be less than the divisor for quotient figure to be correct.

Provide written review of concepts and skills involving whole numbers and fractions.

Mixed Practice

Write an example of each of the following:

1. whole number proper fraction 4-place number

2. mixed number improper fraction 9-place number

3. Change to lowest terms: $\frac{4}{10}$, $\frac{2}{5}$ $\frac{9}{12}$, $\frac{3}{4}$ $\frac{9}{15}$, $\frac{3}{5}$ $\frac{12}{16}$, $\frac{3}{4}$ $\frac{20}{24}$, $\frac{5}{6}$ $\frac{21}{30}$. $\frac{7}{10}$

4. Change to mixed or whole numbers: $\frac{14}{3}$, $4\frac{2}{3}$ $\frac{30}{5}$, 6 $\frac{21}{4}$, $5\frac{1}{4}$ $\frac{16}{6}$, $2\frac{2}{3}$ $\frac{9}{9}$. 1

5. Tell how to check a division example that has a remainder.
Multiply the divisor by the quotient and add the remainder.

6. What is the difference between $5\frac{1}{16}$ and $8\frac{9}{16}$? $3\frac{1}{2}$

7. How many quarts are 5 gal. 1 qt.? 21 7 gal. 3 qt.? 31

8. What part of a yard is 12 in.? $\frac{1}{3}$ 27 in.? $\frac{3}{4}$

Add. Check by going over the work. Remind pupils to change answers to lowest terms.

9.

$\frac{5}{12}$	$\frac{7}{8}$	$2\frac{3}{4}$	$5\frac{9}{10}$	$8\frac{4}{5}$	$8\frac{2}{3}$	$5\frac{11}{16}$
$\frac{1}{12}$	$\frac{1}{8}$	$1\frac{1}{4}$	$3\frac{3}{10}$	$5\frac{2}{5}$	$\frac{1}{3}$	$1\frac{3}{16}$
$\frac{1}{2}$	1	4	$9\frac{1}{5}$	$14\frac{1}{5}$	9	$6\frac{7}{8}$

10. Subtract the numbers in ex. 9 and check the work. $\frac{1}{3}$, $\frac{3}{4}$, $1\frac{1}{2}$, $2\frac{3}{5}$, $3\frac{2}{5}$, $8\frac{1}{3}$, $4\frac{1}{2}$

11. How do you check an example in addition?
By adding down after adding up

12. How do you check an example in subtraction?
By adding the remainder and the subtrahend to get the minuend

Copy in columns, add, and check:

13. 758, 946, 150, 608 2462 8403, 1250, 1547, 6248 17,448

14. 456, 787, 206, 834 2283 2777, 3929, 7323, 1095 15,124

15. 525, 382, 419, 875 2201 3597, 4649, 3059, 2758 14,063

16. What is the difference between \$80.00 and \$32.86? \$47.14

17. How many 45's are there in 3825? 85

18. Find the product of 60 and 319; 19,140 of 208 and 675. 140,400

19. Find the average of 629, 593, 590, and 608. 605

20. How many nickels can you get for 11 quarters, 9 dimes? 73

Use review to spot-check for class or individual areas of weakness. Note if difficulties are caused by lack of understanding of processes, vocabulary, carelessness, and so on. Plan remedial program as needed.

Do problems orally with class, letting different ones explain process involved. Some pupils may need further work in figuring elapsed and future time.

Old Faithful

1. Last summer Bill and Betty went to Yellowstone Park. They were most interested in a geyser called Old Faithful. This geyser has been spouting water ever since it was discovered in 1871. How many years ago is that?

2. Old Faithful spouts water on an average of once every 68 min. The water is so hot that it is almost boiling. Bill and Betty saw Old Faithful spout at 9:54 A.M. They wanted to take a walk and come back in time to see it spout the next time. At what time did they expect it to spout again? 11:02 A.M.

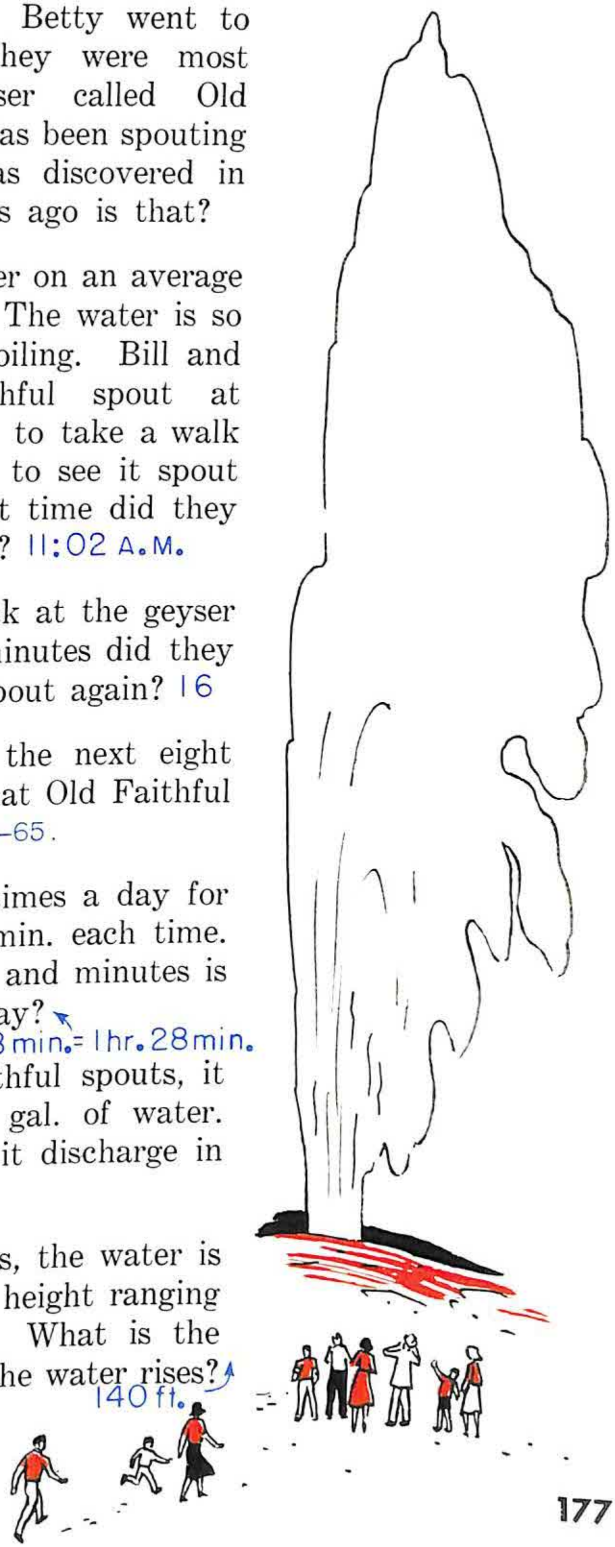
3. Bill and Betty were back at the geyser at 10:46. How many minutes did they have to wait to see it spout again? 16

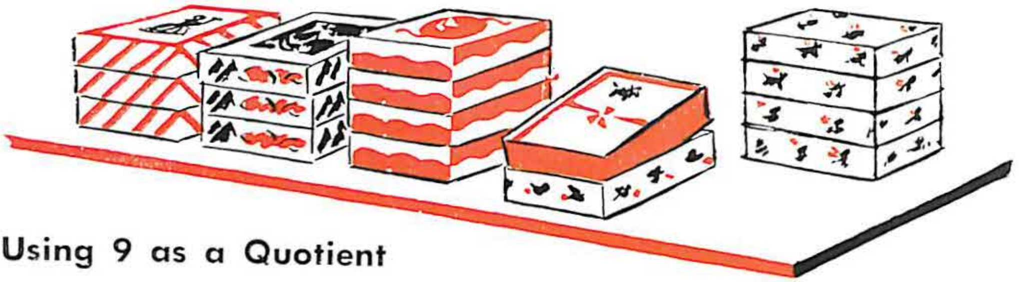
4. Make a table showing the next eight times after 11:02 A.M. that Old Faithful spouted that day. See G-65.

5. Old Faithful spouts 22 times a day for an average period of 4 min. each time. During how many hours and minutes is it spouting water each day? 88 min.= 1 hr. 28 min.

6. Each time that Old Faithful spouts, it discharges about 10,000 gal. of water. How many gallons does it discharge in 22 times? 220,000

7. When Old Faithful spouts, the water is thrown into the air to a height ranging from 120 ft. to 160 ft. What is the average height to which the water rises? 140 ft.





Using 9 as a Quotient

1. **Problem** Mr. Jackson bought 25 boxes of writing paper to sell in his store. He paid \$24.50 for them. What did Mr. Jackson pay for 1 box of paper? \$.98

$$\begin{array}{r} \$.98 \\ 25\overline{)\$24.50} \\ \underline{22\,5} \\ 2\,00 \\ \underline{2\,00} \end{array}$$

Explanation Since 24 is less than the divisor 25, you must use 245 as the first partial dividend. To divide 245 by 25, think, "How many 2's are there in 24?" You know there are 12, but 12 cannot be the first quotient figure because 9 is the largest quotient figure you can have. Try 9 as the quotient. Multiply 25 by 9, which gives 225. Subtract 225 from 245, which leaves 20. Is 9 the correct figure? Bring down the next figure from the dividend.

To divide 200 by 25, think, "How many 2's are there in 20?" You know there are 10, but 9 is the largest quotient figure you can have. Try 9. You see that 9 is too large because you cannot subtract 225 from 200. Then try 8. Tell why 8 is right.

2. Tell how the quotient figures below are found:

$$\begin{array}{r} 98 \\ 23\overline{)2254} \\ \underline{207} \\ 184 \\ \underline{184} \end{array} \qquad \begin{array}{r} 89 \\ 45\overline{)4005} \\ \underline{360} \\ 405 \\ \underline{405} \end{array} \qquad \begin{array}{r} 99 \\ 34\overline{)3366} \\ \underline{306} \\ 306 \\ \underline{306} \end{array} \qquad \begin{array}{r} 88 \\ 23\overline{)2024} \\ \underline{184} \\ 184 \\ \underline{184} \end{array}$$

3. Divide by 25: 2475 99 2225 89 2200 88 2425 97 22,100 884

4. Divide by 24: 2376 99 2136 89 2112 88 2352 98 23,664 986

To the Teacher. Cases like those above, where the trial quotient figure is 10, 11, or 12, occur infrequently with divisors ending in 1 to 5; they never occur with divisors ending in 6 to 9 if the rule on page 154 is followed.

Be sure pupils understand "why" 12 cannot be first quotient figure (since 12 is not a 1-figure number), and "why" 9 is largest quotient figure we can have in any one place. Have pupils explain ex. 3-4.

Division Practice

Divide and check the work:

1. 221 ÷ 24 9R5 3290 ÷ 33 ✓ 99R23 3264 ÷ 34 96 23,775 ÷ 25 951
2. 207 ÷ 22 9R9 4372 ÷ 44 ✓ 99R16 3395 ÷ 35 97 44,854 ÷ 45 996R34
3. 222 ÷ 25 8R22 2037 ÷ 21 97 2162 ÷ 23 94 21,683 ÷ 22 985R13
4. 300 ÷ 34 8R28 2041 ÷ 23 ✓ 88R17 4042 ÷ 43 94 20,844 ÷ 25 833R19
5. 400 ÷ 45 8R40 2461 ÷ 25 ✓ 98R11 3280 ÷ 33 ✓ 99R13 20,247 ÷ 21 964R3
6. 223 ÷ 23 9R16 4371 ÷ 45 ✓ 97R6 2415 ÷ 35 69 30,045 ÷ 34 883R23
7. 337 ÷ 35 9R22 3124 ÷ 35 ✓ 89R9 4410 ÷ 45 98 51,398 ÷ 53 969R41
8. 209 ÷ 21 9R20 4460 ÷ 45 ✓ 99R5 2001 ÷ 23 87 34,825 ÷ 35 995

More Practice. See ㉗ on page 319.

Which Is the Right Answer?

One of the numbers after the problem is the answer. Which is it?

9. The 35 children in Miss Black's room sold 630 tickets for the flower show. Find the average number of tickets sold per child. (20 tickets; 19 tickets; 18 tickets)

10. Joe rode in the car with his father from 1:50 until 3:20. How long did they ride? (2 hr. 30 min.; 2 hr. 10 min.; 1 hr. 30 min.)

11. What is the cost of 250 story books at $2.95 each? ($737.50; $7375; $73.75)

12. After selling peanuts at a ball game Don counted his money. He had 8 dollar bills, 3 half dollars, 9 quarters, 30 dimes, and 19 nickels. How much did he have in all? ($16.00; $15.70; $14.70)

13. Mother sold 300 cookies in packages, with 1 doz. cookies in each package. At a price of $.45 a dozen, how much did Mother get for the cookies? ($11.05; $11.25; $9.50)

Let different pupils explain their work in ex. 1-3 at board.
Determine now if pupils are secure in their understanding
of process. Then have pupils do ex. 4-8 independently,
but note work habits.

See G-65 for correlation of examples with aims.

Chapter Review

Read these numbers:

1. 368,146 368 thousand, 1 hundred, 46 1,210,146 1 million, 210 thousand, 1 hundred, 46 10,000,360 10 million, 3 hundred, 60 410,100,050 410 million, 100 thousand, 50
2. MCML 1950 LXIV 64 MDCCCLXV 1865 DCCLXIV 764
3. XLIX 49 MCDXCII 1492 MDCCLXXVI 1776 MDXXIX 1529
4. Tell what each figure in 2385 means. 2 thousands, 3 hundreds, 8 tens, 5 ones Multiply 2385 by 10, making 23,850. In the new number 5 ones become 5 tens. What do 8 tens become? 8 hundreds 3 hundreds? 3 thousands 2 thousands? 20 thousands

Write these numbers:

5. Six million, five hundred 6,000,500
6. Twelve million, ten thousand, fifty 12,010,050
7. Eighteen million, one thousand, four 18,001,004
8. Five hundred twenty-three million, four hundred ten 523,000,410

Divide and check:

9.	$37\overline{)365}$ 9R32	$77\overline{)560}$ 7R21	$29\overline{)148}$ 5R3	$18\overline{)5166}$ 287	$67\overline{)48173}$ 719
10.	$78\overline{)392}$ 5R2	$68\overline{)552}$ 8R8	$48\overline{)998}$ 20R38	$27\overline{)5618}$ 208R2	$32\overline{)22680}$ 708R24
11.	$17\overline{)576}$ 33R15	$13\overline{)712}$ 54R10	$36\overline{)228}$ 6R12	$14\overline{)1375}$ 98R3	$84\overline{)51156}$ 609
12.	$93\overline{)997}$ 10R67	$38\overline{)768}$ 20R8	$19\overline{)799}$ 42R1	$15\overline{)9136}$ 609R1	$87\overline{)69868}$ 803R7

Estimate the answer to each exercise.(1) **Then find the exact answer:**(2)

	(1) 800	180	300	50
(2) 13.	20 × 39 780	98 + 79 177	395 − 107 288	1495 ÷ 29 51R16
	900	170	200	70
14.	29 × 31 899	83 + 89 172	702 − 498 204	4899 ÷ 71 69

Add and check:

15.	$\frac{9}{16}$	$4\frac{7}{8}$	$3\frac{3}{5}$	$2\frac{7}{8}$	$5\frac{11}{12}$	$7\frac{11}{16}$	$8\frac{9}{10}$	$9\frac{3}{4}$
	$\frac{5}{16}$	$2\frac{3}{8}$	$1\frac{1}{5}$	$1\frac{3}{8}$	$4\frac{7}{12}$	$2\frac{5}{16}$	$4\frac{3}{10}$	$2\frac{1}{4}$
	$\frac{7}{8}$	$7\frac{1}{4}$	$4\frac{4}{5}$	$4\frac{1}{4}$	$10\frac{1}{2}$	10	$13\frac{1}{5}$	12

16. Subtract the numbers in ex. 15 and check the work. $\frac{1}{4}, 2\frac{1}{2}, 2\frac{2}{5}, 1\frac{1}{2}, 1\frac{1}{3}, 5\frac{3}{8}, 4\frac{3}{5}, 7\frac{1}{2}$

Correct papers and analyze errors. Note results on progress cards. Discuss errors with the individuals to try to find out why they were made. Plan remedial work for these pupils.

A Problem Test

1. Bob will build a bookcase with 4 shelves, each 30 in. long. How many feet of shelf space will he have? 10

2. Bob needs two boards for ends, each 4 ft. long. How many feet of lumber will he need for the shelves and ends of his bookcase? 18 At $.60 a foot, how much will Bob's lumber cost? $10.80 See ex. 1.

3. Mr. Swift took in $134.75 from the sale of 49-cent books. How many books did he sell at that price? 275
   ▶ First change $134.75 to 13,475¢.

4. Patty weighs $82\frac{3}{4}$ lb. this spring. A year ago she weighed $76\frac{1}{4}$ lb. How much has she gained during the year? $6\frac{1}{2}$ lb.

5. Don worked $2\frac{1}{4}$ hr. on Friday and $6\frac{3}{4}$ hr. on Saturday. At $.60 an hour, how much did Don earn in the two days? $5.40

6. Fourteen children took in $75.90 from the sale of seeds. What was the average amount taken in per child? $5.42

7. Mrs. Long is making a dress for herself and one like it for Betsy. She needed $4\frac{1}{8}$ yd. for her dress and $2\frac{7}{8}$ yd. for Betsy's. How much cloth did she need for both? 7 yd. Find the cost of the cloth at $.78 a yard. $5.46

8. Mrs. Long needs 21 buttons for her dress and 15 buttons for Betsy's dress. How many dozen buttons must she buy? 3 How much will they cost at $.39 a dozen? $1.17

9. In 12 hr. an airplane flew a distance of 2940 mi. What was the average number of miles it flew per hour? 245

10. Last month Mrs. Brown bought 61 qt. of milk at 23¢ a quart. How much was her milk bill last month? $14.03

Look below to find out what your score means. Have pupils record scores on own charts and compare with previous ones.

SCORE	0–5 You need help	6–7 Fair	8–9 Good	10 Excellent

Group pupils for discussion of errors. Are they using all problem aids they know? Are they making errors in computations? Are they using incorrect process? Let others work at arithmetic corner.

See G-67 for specific aims of Chapter 6.

Chapter 6

Boarding Dogs

Provide experiences in cost analysis (pages 183-184).

1. Ben lives in a house with a large yard. He has opened a boarding house for dogs and will take care of dogs when their owners are away. He is boarding 5 dogs at present. Curly and Jerry are small dogs; Spot and Jack are larger dogs, while Prince is still larger. The amount of food Ben gives each dog depends upon the dog's weight. This table shows the amount of food each dog gets per day:

Curly	$\frac{3}{4}$ lb.	Spot	$1\frac{3}{4}$ lb.	Prince	$2\frac{1}{4}$ lb.
Jerry	$1\frac{1}{4}$ lb.	Jack	2 lb.		

How many pounds do all 5 dogs eat per day? 8

2. Ben bought 4 bags of dog food at \$6.00 per bag. How much did the 4 bags cost? \$24.00 Each bag holds 50 lb. of food. How many pounds did Ben buy? 200 How many days will the food last the 5 dogs if they eat 8 lb. a day? 25

3. If 50 lb. of food cost \$6.00, how many cents does the food cost per pound? \$.12

Main purpose of this work is to introduce to pupils need for determining whether a certain article, or thing, is a good investment of time and money.

Present diagnostic test of division skills.

How Much Have You Learned?

In this chapter you have been taught many things about division. On this page you will find examples of each kind of division exercise that you have done. You can check yourself to see how much you have learned. If you miss more than one example in any row, turn to the Practice Pages for that row.

Divide and check. Write R before remainders:

				Practice Pages
1.	2R6 39)84	1R35 56)91	3R11 28)95	153
2.	7R27 47)356	7R30 76)562	8R33 38)337	154, 155
3.	16R15 58)943	24R10 29)706	24R21 36)885	156, 157
4.	78R27 37)2913	56R13 48)2701	45R18 59)2673	156, 157
5.	485 51)24735	775 32)24800	564 43)24252	159
6.	334R17 66)22061	377R21 27)10200	635R5 49)31120	159
7.	\$ 3.15 25)\$78.75	\$ 1.31 75)\$98.25	\$ 1.36R10¢ 59)\$80.34	164
8.	8 19)152	9 67)603	7 46)322	166, 167
9.	84 57)4788	831R2 77)63989	941 86)80926	169
10.	430 82)35260	580R15 72)41775	450R12 36)16212	171
11.	605 39)23595	507R9 83)42090	308 72)22176	173
12.	842R4 13)10950	936 14)13104	843R2 15)12647	175
13.	678 18)12204	768R4 17)13060	843 16)13488	175
14.	929R19 34)31605	992R16 43)42672	837 25)20925	178, 179

In analyzing errors, try to determine if estimation of quotients, multiplication, subtraction, quotient placement, and so on, cause errors. Reteach accordingly.

Boarding Dogs

1. Curly gets $\frac{3}{4}$ lb. of food per day. At 12¢ per pound, how many cents per day does Curly's food cost? 9¢

2. Jerry eats $1\frac{1}{4}$ lb. of food per day. To find the cost of $1\frac{1}{4}$ lb., first find the cost of $\frac{1}{4}$ lb.; 3¢ then find the cost of 1 lb. 12¢ and add the two amounts. (1) Spot eats $1\frac{3}{4}$ lb. per day; (2) Jack eats 2 lb., (3) and Prince eats $2\frac{1}{4}$ lb. (4) Find the cost of food per day for each of these dogs. (1) 15¢; (2) 21¢; (3) 24¢; (4) 27¢

3. In ex. 1 and 2 you found the cost of feeding each dog for 1 day. Find the cost of feeding each dog per week. Curly, $.63; Jerry, $1.05; Spot, $1.47; Jack, $1.68; Prince, $1.89

4. Every week the owner of each dog pays Ben the cost of the food for his dog and 75¢ extra for taking care of the dog. Ben made a table like the one below to show how much each owner should pay him a week.

	Cost of Food per Day	Cost of Food per Week	Care per Week	Total Cost per Week
Curly	$.09	$ .63	$.75	$ 1.38
Jerry	.15	1.05	.75	1.80
Spot	.21	1.47	.75	2.22
Jack	.24	1.68	.75	2.43
Prince	.27	1.89	.75	2.64
				$10.47

The amounts that Ben put in the first two columns were found in ex. 1 to 3. How did Ben find $1.38 and $1.80 in the last column? He added the second and third columns. Make a table like Ben's and fill in all the spaces. Which column does Ben add to find out how much in all the 5 owners pay him a week? Last How much is it? $10.47

5. Ben is thinking of charging $1.00 a week instead of $.75 for taking care of each dog. If he did that, how much in all would he receive per week from each owner? See G-68. Make a table like the one above, using $1.00 instead of $.75. See G-68.

6. Suppose Ben does charge $1.00 instead of $.75 for the care of each dog. Then how much more will he make per week on the 5 dogs he is now boarding? $1.25

This activity might be extended by showing pupils how to keep accounts of cost of feeding their own pets, projected on monthly basis.

Review fraction skills and multiplication and division of whole numbers.

Review

1. Use the numbers 1, 2, and 3, or any two of them, and write an example of a proper fraction; of an improper fraction; of a mixed number.

2. Change each fraction to lowest terms: Be sure pupils understand meaning of lowest terms.

$\frac{2}{8}$ $\frac{1}{4}$ $\frac{3}{6}$ $\frac{1}{2}$ $\frac{10}{16}$ $\frac{5}{8}$ $\frac{12}{18}$ $\frac{2}{3}$ $\frac{16}{24}$ $\frac{2}{3}$ $\frac{8}{12}$ $\frac{2}{3}$ $\frac{4}{10}$ $\frac{2}{5}$ $\frac{16}{20}$ $\frac{4}{5}$ $\frac{12}{15}$ $\frac{4}{5}$

3. Change to a whole number or a mixed number:

$\frac{12}{12}$ 1 $\frac{18}{8}$ $2\frac{1}{4}$ $\frac{15}{4}$ $3\frac{3}{4}$ $\frac{17}{3}$ $5\frac{2}{3}$ $\frac{21}{10}$ $2\frac{1}{10}$ $\frac{32}{8}$ 4 $\frac{10}{2}$ 5 $\frac{32}{5}$ $6\frac{2}{5}$ $\frac{13}{12}$ $1\frac{1}{12}$

Add and check: Ask pupils why they may add fractions.

4.	$\frac{15}{16}$	$\frac{3}{8}$	$\frac{5}{6}$	$4\frac{5}{12}$	$3\frac{9}{16}$	$5\frac{1}{10}$	$2\frac{7}{12}$	$8\frac{11}{16}$
	$\frac{9}{16}$	$\frac{7}{8}$	$\frac{5}{6}$	$7\frac{5}{12}$	$3\frac{9}{16}$	$4\frac{7}{10}$	$7\frac{5}{12}$	$4\frac{5}{16}$
	$1\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{2}{3}$	$11\frac{5}{6}$	$7\frac{1}{8}$	$9\frac{4}{5}$	10	13
5.	$\frac{7}{10}$	$\frac{1}{3}$	$\frac{3}{4}$	$1\frac{9}{10}$	$3\frac{11}{12}$	$2\frac{5}{16}$	$6\frac{3}{10}$	$5\frac{5}{12}$
	$\frac{7}{10}$	$\frac{2}{3}$	$\frac{3}{4}$	$3\frac{7}{10}$	$4\frac{7}{12}$	$\frac{11}{16}$	$2\frac{3}{10}$	$5\frac{7}{12}$
	$1\frac{2}{5}$	1	$1\frac{1}{2}$	$5\frac{3}{5}$	$8\frac{1}{2}$	3	$8\frac{3}{5}$	11

Subtract and check: Ask pupils why they may subtract.

6.	$\frac{9}{10}$	$\frac{7}{8}$	$\frac{5}{6}$	$8\frac{15}{16}$	$6\frac{7}{12}$	$5\frac{9}{10}$	$4\frac{15}{16}$	$7\frac{11}{12}$
	$\frac{3}{10}$	$\frac{3}{8}$	$\frac{1}{6}$	$4\frac{3}{16}$	$3\frac{7}{12}$	$5\frac{1}{10}$	$1\frac{7}{16}$	$2\frac{1}{12}$
	$\frac{3}{5}$	$\frac{1}{2}$	$\frac{2}{3}$	$4\frac{3}{4}$	3	$\frac{4}{5}$	$3\frac{1}{2}$	$5\frac{5}{6}$

Divide and check:

7.	38 $75\overline{)2850}$	93 $48\overline{)4464}$	207R6 $32\overline{)6630}$	98R12 $52\overline{)5108}$
8.	240 $37\overline{)8880}$	72 $58\overline{)4176}$	509R7 $19\overline{)9678}$	310R7 $13\overline{)4037}$
9.	76R68 $84\overline{)6452}$	504R12 $16\overline{)8076}$	104R11 $93\overline{)9683}$	71R60 $68\overline{)4888}$

Multiply and check the work:

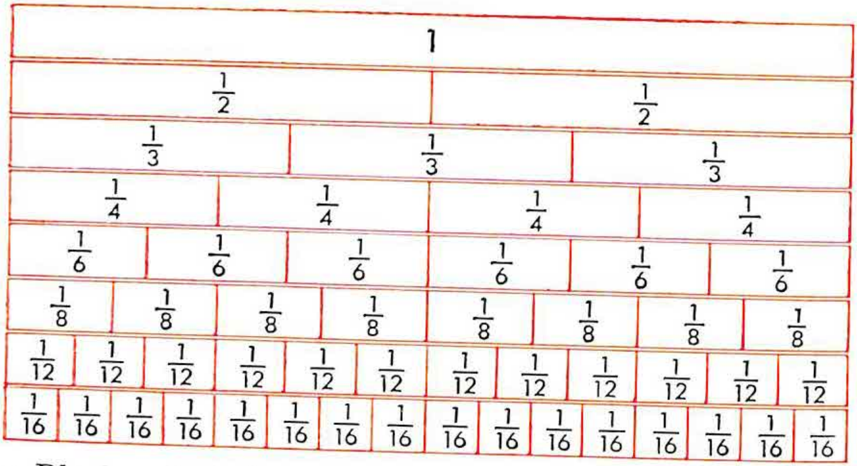
10.	40 × 83 3320	29 × 4163 120,727	364 × 625 227,500	436 × 347 151,292
11.	70 × 96 6720	65 × 8090 525,850	215 × 507 109,005	500 × 634 317,000
12.	38 × 57 2166	17 × 3815 64,855	398 × 950 378,100	709 × 724 513,316

Urge more advanced pupils to do ex. 1-6 orally. Be sure all pupils have good mastery and understanding of fraction skills before beginning new work.

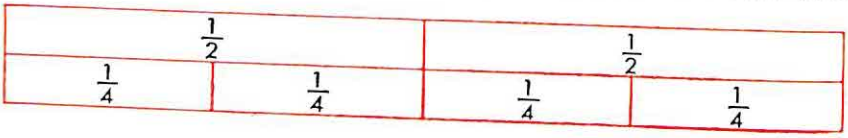
Review meaning of equal fractions and show another way a fraction can be changed to an equal one.

Equal Fractions

1. Miss Black cut 8 strips of cardboard, each 12 in. long and $\frac{3}{4}$ in. wide. On one strip she wrote 1, as shown below. The other 7 strips she divided into equal parts. One of them she divided into 2 equal parts and on each part she wrote $\frac{1}{2}$. Look at the picture below to see how she divided and marked the other 6 strips.



2. Miss Black asked Ann to put the strip marked into halves and the one marked into fourths together to see if any of the marks came together. The strips looked as shown below.



Ann said that 1 half was the same as 2 fourths. Do you agree? Does $\frac{1}{2} = \frac{2}{4}$? Does $\frac{1}{2}$ dollar equal $\frac{2}{4}$ of a dollar?

3. The other boys and girls used the strips and found many pairs of equal fractions. By using strips of cardboard, show that the fractions in the following pairs are equal:

$\frac{1}{3} = \frac{2}{6}$ $\frac{1}{4} = \frac{2}{8}$ $\frac{1}{8} = \frac{2}{16}$ $\frac{1}{4} = \frac{4}{16}$ $\frac{1}{3} = \frac{4}{12}$

$\frac{1}{2} = \frac{4}{8}$ $\frac{1}{2} = \frac{3}{6}$ $\frac{1}{2} = \frac{6}{12}$ $\frac{1}{2} = \frac{8}{16}$ $\frac{1}{4} = \frac{3}{12}$

4. With 2 of the strips you cut show that $\frac{3}{4} = \frac{6}{8}$. Can you see an easy way to change $\frac{3}{4}$ to $\frac{6}{8}$ without using the strips?

Let pupils use strips, as shown above, or own fractional parts in doing ex. 2-3. Let them state rule for changing fractions to higher terms in own words.

5. You have already learned that you can change $\frac{6}{8}$ to $\frac{3}{4}$ by **dividing** both terms of $\frac{6}{8}$ by 2, as shown in A at the right. You can change $\frac{3}{4}$ back to $\frac{6}{8}$ by **multiplying** both terms of $\frac{3}{4}$ by 2, as shown in B.

A. $\frac{6 \div 2}{8 \div 2} = \frac{3}{4}$

B. $\frac{3 \times 2}{4 \times 2} = \frac{6}{8}$

6. Suppose you want to change $\frac{3}{8}$ to an equal fraction with a denominator of 16. By what must you multiply the denominator of $\frac{3}{8}$ to get 16? Then you must also multiply the numerator 3 by the same number. See the work in C above.

C. $\frac{3 \times 2}{8 \times 2} = \frac{6}{16}$

7. By what do you multiply both terms of $\frac{2}{5}$ to get $\frac{4}{10}$? 2 Does $\frac{2}{5} = \frac{4}{10}$? Yes

In the exercises below tell the missing numbers. First decide by what number you must multiply the denominator to get the new denominator. Then multiply the numerator by the same number: Do orally.

8. $\frac{1}{3} = \frac{?}{6}$ 2 $\quad \frac{2}{4} = \frac{?}{8}$ 4 $\quad \frac{4}{8} = \frac{?}{16}$ 8 $\quad \frac{3}{5} = \frac{?}{10}$ 6 $\quad \frac{2}{3} = \frac{?}{12}$ 8

9. $\frac{3}{4} = \frac{?}{8}$ 6 $\quad \frac{2}{3} = \frac{?}{6}$ 4 $\quad \frac{1}{5} = \frac{?}{10}$ 2 $\quad \frac{5}{6} = \frac{?}{12}$ 10 $\quad \frac{5}{8} = \frac{?}{16}$ 10

10. $\frac{1}{2} = \frac{?}{6}$ 3 $\quad \frac{2}{2} = \frac{?}{8}$ 8 $\quad \frac{4}{5} = \frac{?}{10}$ 8 $\quad \frac{7}{8} = \frac{?}{16}$ 14 $\quad \frac{1}{4} = \frac{?}{12}$ 3

11. $\frac{4}{4} = \frac{?}{8}$ 8 $\quad \frac{1}{2} = \frac{?}{4}$ 2 $\quad \frac{3}{4} = \frac{?}{16}$ 12 $\quad \frac{4}{4} = \frac{?}{12}$ 12 $\quad \frac{6}{8} = \frac{?}{16}$ 12

12. $\frac{2}{2} = \frac{?}{6}$ 6 $\quad \frac{1}{4} = \frac{?}{8}$ 2 $\quad \frac{5}{5} = \frac{?}{10}$ 10 $\quad \frac{2}{4} = \frac{?}{12}$ 6 $\quad \frac{3}{8} = \frac{?}{16}$ 6

13. $\frac{3}{3} = \frac{?}{6}$ 6 $\quad \frac{1}{2} = \frac{?}{8}$ 4 $\quad \frac{1}{3} = \frac{?}{12}$ 4 $\quad \frac{2}{5} = \frac{?}{10}$ 4 $\quad \frac{3}{4} = \frac{?}{12}$ 9

14. $\frac{1}{3} = \frac{?}{9}$ 3 $\quad \frac{2}{2} = \frac{?}{4}$ 4 $\quad \frac{4}{6} = \frac{?}{12}$ 8 $\quad \frac{2}{8} = \frac{?}{16}$ 4 $\quad \frac{1}{6} = \frac{?}{12}$ 2

15. $\frac{3}{3} = \frac{?}{9}$ 9 $\quad \frac{2}{3} = \frac{?}{9}$ 6 $\quad \frac{1}{4} = \frac{?}{16}$ 4 $\quad \frac{1}{2} = \frac{?}{12}$ 6 $\quad \frac{1}{8} = \frac{?}{16}$ 2

16. Ann had $\frac{1}{2}$ yd. of ribbon which she cut into eighths. How many eighths did she have? 4 $\frac{1}{2}$ equals how many 8ths? 4

Reinforce through demonstration.

If you multiply both terms of a fraction by the same number, you get another fraction with the same value.

After pupils have made own generalization about changing fractions, proceed with ex. 5-7. Demonstrate and emphasize that new fraction has same value as original, parts are smaller, but there are more of them.

Prepare for addition of unlike fractions.

Adding Like Things

1. You know that you can add only things that are alike or that have the **same name.** You can add 5 birds and 2 birds because they both have the same name. The answer is 7 birds. You can add 4 nickels and 5 nickels because they both have the same name. The answer is 9 nickels.

2. You cannot add 3 dimes and 3 cents because they have **different** names. You must first change them to equal things with the same name. You can change 3 dimes to 30 cents because they are equal. Then you can add 30 cents and 3 cents, as shown in A.

A. 3 dimes = 30 cents
3 cents = 3 cents
33 cents

B. 2 yards = 6 feet
2 feet = 2 feet
8 feet

3. You cannot add 2 yards and 2 feet because they have different names. But you can change 2 yards to 6 feet since they are equal. Then you can add 6 feet and 2 feet, as shown in B.

4. Suppose you want to add 2 cows and 4 horses. You cannot call the cows horses and you cannot call the horses cows. You can call both of them **animals.** Then 2 animals and 4 animals are 6 animals.

2 cows = 2 animals
4 horses = 4 animals
6 animals

Add these. If the numbers do not have the same name, change them so that you can add them:

5.	8 cents = 8 cents 3 dimes = 30 cents 38 cents	5 feet = 5 feet 4 yards = 12 feet 17 feet	5 birds 7 birds 12 birds	2 quarters = 10 nickels 8 nickels = 8 nickels 18 nickels, or 90 cents
6.	3 robins = 3 birds 2 crows = 2 birds 5 birds	1 quart = 2 pints 5 pints = 5 pints 7 pints	6 cents 6 cents 3 quarters = 75 cents 81 cents	1 hour = 60 minutes 17 minutes = 17 minutes 77 minutes
7.	4 hours 5 hours 9 hours	2 dogs = 2 animals 4 cats = 4 animals 6 animals	6 nickels = 30 pennies 2 pennies = 2 pennies 32 pennies	5 gallons = 20 quarts 3 quarts = 3 quarts 23 quarts

Follow development in ex. 1–4. Emphasize need of changing unlike things to like ones before adding.

Teach addition of unlike fractions (pages 189-191).

Walking to School

1. Problem Patty walks $\frac{1}{2}$ mi. to Jean's house and then both girls walk $\frac{1}{4}$ mi. to school. How far does Patty walk in all? $\frac{3}{4}$ mi.

$$\begin{array}{r} \frac{1}{2} = \frac{2}{4} \\ \frac{1}{4} = \frac{1}{4} \\ \hline \frac{3}{4} \end{array}$$

Explanation You have to add $\frac{1}{2}$ and $\frac{1}{4}$. You cannot add **halves** and **fourths** because they have different names, or different denominators. If you change $\frac{1}{2}$ to $\frac{2}{4}$, you can then add $\frac{2}{4}$ and $\frac{1}{4}$ because they have the **same name,** or the **same denominator.** The sum is $\frac{3}{4}$. Patty walks $\frac{3}{4}$ mi. in all.

2. Fractions having the same denominator, like $\frac{2}{4}$ and $\frac{1}{4}$, are said to have a **common denominator.** The common denominator for $\frac{2}{4}$ and $\frac{1}{4}$ is 4. Use other sets of fractions to illustrate term "common denominator."

Change the fractions below to fractions with the same denominator and add them. Check your work by going over it:

3.	$\frac{1}{8}$ $\frac{3}{4}$ $\frac{7}{8}$	$\frac{1}{4}$ $\frac{1}{8}$ $\frac{3}{8}$	$\frac{1}{4}$ $\frac{3}{8}$ $\frac{5}{8}$	$\frac{1}{2}$ $\frac{3}{8}$ $\frac{7}{8}$	$\frac{5}{8}$ $\frac{1}{4}$ $\frac{7}{8}$	$\frac{1}{8}$ $\frac{3}{16}$ $\frac{5}{16}$	$\frac{3}{16}$ $\frac{1}{2}$ $\frac{11}{16}$	$\frac{11}{16}$ $\frac{1}{8}$ $\frac{13}{16}$	$\frac{1}{4}$ $\frac{7}{12}$ $\frac{5}{6}$	$\frac{1}{2}$ $\frac{3}{10}$ $\frac{4}{5}$
4.	$\frac{1}{8}$ $\frac{1}{4}$ $\frac{3}{8}$	$\frac{2}{3}$ $\frac{1}{6}$ $\frac{5}{6}$	$\frac{1}{2}$ $\frac{1}{8}$ $\frac{5}{8}$	$\frac{1}{6}$ $\frac{1}{3}$ $\frac{1}{2}$	$\frac{1}{2}$ $\frac{1}{6}$ $\frac{2}{3}$	$\frac{5}{16}$ $\frac{3}{8}$ $\frac{11}{16}$	$\frac{7}{16}$ $\frac{1}{4}$ $\frac{11}{16}$	$\frac{3}{16}$ $\frac{3}{8}$ $\frac{9}{16}$	$\frac{5}{12}$ $\frac{1}{2}$ $\frac{11}{12}$	$\frac{3}{4}$ $\frac{3}{16}$ $\frac{15}{16}$

More Practice. See ㉘ on page 319. Use for pupils having difficulty in finding common denominator.

Emphasize.

To add fractions having different denominators, first change them to fractions having the same denominator.

In ex. 1 be sure pupils see why they cannot add $\frac{1}{2}$ and $\frac{1}{4}$. Have them tell you "how" they can change $\frac{1}{2}$ to $\frac{2}{4}$. Do some problems in ex. 3 with pupils. Then observe them as they complete others independently.

More about Fractions

1. **Problem** Betty made an apron for her mother and one for her sister. She used $\frac{7}{8}$ yd. for one apron and $\frac{3}{4}$ yd. for the other. How much material did she use for both aprons? $1\frac{5}{8}$ yd.

Explanation You must change $\frac{7}{8}$ and $\frac{3}{4}$ to a common denominator before you can add them. You can change $\frac{3}{4}$ to $\frac{6}{8}$. $\frac{7}{8}$ and $\frac{6}{8}$ are $\frac{13}{8}$ or $1\frac{5}{8}$. Betty used $1\frac{5}{8}$ yd. in all.

$$\begin{array}{r} \frac{7}{8} = \frac{7}{8} \\ \frac{3}{4} = \frac{6}{8} \\ \hline \frac{13}{8} = 1\frac{5}{8} \end{array}$$

2. Each morning Fred walks $\frac{1}{2}$ mi. to Don's house. Don's father takes the boys $\frac{7}{8}$ mi. to school. How far does Fred have to go to get to school? $1\frac{3}{8}$ mi.

3. Jane spends $\frac{1}{2}$ hr. each evening on her school work. She also practices her music lesson for $\frac{3}{4}$ hr. How many hours does Jane spend on her lessons each evening? $1\frac{1}{4}$

Change these fractions to fractions with the same denominator and then add them. Be sure to change all proper fractions to lowest terms and to change improper fractions to mixed numbers: Stress.

4.	$\frac{5}{8}$ $\frac{1}{2}$ $1\frac{1}{8}$	$\frac{3}{4}$ $\frac{3}{8}$ $1\frac{1}{8}$	$\frac{5}{12}$ $\frac{2}{3}$ $1\frac{1}{12}$	$\frac{11}{16}$ $\frac{3}{4}$ $1\frac{7}{16}$	$\frac{9}{10}$ $\frac{4}{5}$ $1\frac{7}{10}$	$\frac{11}{12}$ $\frac{5}{6}$ $1\frac{3}{4}$	$\frac{7}{16}$ $\frac{3}{8}$ $\frac{13}{16}$
5.	$\frac{3}{4}$ $\frac{5}{8}$ $1\frac{3}{8}$	$\frac{5}{6}$ $\frac{2}{3}$ $1\frac{1}{2}$	$\frac{13}{16}$ $\frac{1}{4}$ $1\frac{1}{16}$	$\frac{5}{8}$ $\frac{7}{16}$ $1\frac{1}{16}$	$\frac{3}{16}$ $\frac{5}{8}$ $\frac{13}{16}$	$\frac{1}{5}$ $\frac{9}{10}$ $1\frac{1}{10}$	$\frac{3}{4}$ $\frac{3}{16}$ $\frac{15}{16}$
6.	$\frac{1}{3}$ $\frac{5}{6}$ $1\frac{1}{6}$	$\frac{5}{6}$ $\frac{1}{2}$ $1\frac{1}{3}$	$\frac{7}{8}$ $\frac{9}{16}$ $1\frac{7}{16}$	$\frac{5}{16}$ $\frac{7}{8}$ $1\frac{3}{16}$	$\frac{7}{10}$ $\frac{1}{5}$ $\frac{9}{10}$	$\frac{9}{10}$ $\frac{2}{5}$ $1\frac{3}{10}$	$\frac{11}{12}$ $\frac{1}{4}$ $1\frac{1}{6}$

7. George drinks $\frac{3}{4}$ qt. of milk each day. His sister drinks $\frac{1}{2}$ qt. How many quarts of milk do both drink each day? $1\frac{1}{4}$

8. Sally needs $\frac{7}{8}$ of a cup of sugar for her cookies and $\frac{3}{4}$ of a cup of sugar for a pie she is making. How many cups of sugar does she need for her baking? $1\frac{5}{8}$

More Practice. See ㉙ on page 320.

Discuss ex. 1 carefully with pupils (use materials if necessary). In ex. 4-8 have pupils explain why they changed the larger "parts" to smaller ones and how they found the common denominator.

Adding Unlike Fractions

1. In the addition examples below the fractions have different, or unlike, denominators. To add these fractions you must first change them to fractions with the same denominator. When the denominators are not the same, see if the smaller denominator can be changed to the larger denominator.

A.	B.	C.
$6\frac{1}{2} = 6\frac{6}{12}$	$1\frac{5}{8} = 1\frac{10}{16}$	$2\frac{3}{5} = 2\frac{6}{10}$
$3\frac{5}{12} = 3\frac{5}{12}$	$6\frac{7}{16} = 6\frac{7}{16}$	$5\frac{9}{10} = 5\frac{9}{10}$
$9\frac{11}{12}$	$7\frac{17}{16} = 8\frac{1}{16}$	$7\frac{15}{10} = 8\frac{5}{10} = 8\frac{1}{2}$

In example A, the fractions are $\frac{1}{2}$ and $\frac{5}{12}$. In this case the smaller denominator 2 can be changed to the larger denominator 12 by multiplying 2 by 6. So you multiply both numerator and denominator of $\frac{1}{2}$ by 6 to change $\frac{1}{2}$ to $\frac{6}{12}$. In this case the common denominator is 12.

In example B, the fractions are $\frac{5}{8}$ and $\frac{7}{16}$. You can change the smaller denominator 8 to the larger denominator 16 by multiplying by 2. So multiply both numerator and denominator of $\frac{5}{8}$ by 2, which gives $\frac{10}{16}$.

In example C, by what number do you multiply the smaller denominator 5 to change it to 10? Then multiply both numerator and denominator of $\frac{3}{5}$ by that number. Be sure to give the sum in simplest form. Stress.

In ex. 2-4, let pupils use intervening step if necessary.

Add. First change the fractions to fractions with like denominators:

2.	$2\frac{3}{4}$ $4\frac{3}{8}$ $7\frac{1}{8}$	$1\frac{5}{6}$ $5\frac{2}{3}$ $7\frac{1}{2}$	$3\frac{5}{12}$ $6\frac{3}{4}$ $10\frac{1}{6}$	$2\frac{1}{2}$ $2\frac{7}{10}$ $5\frac{1}{5}$	$4\frac{7}{8}$ $3\frac{5}{16}$ $8\frac{3}{16}$	$2\frac{7}{12}$ $6\frac{3}{4}$ $9\frac{1}{3}$	$9\frac{1}{6}$ $1\frac{11}{12}$ $11\frac{1}{12}$
3.	$7\frac{2}{3}$ $2\frac{1}{6}$ $9\frac{5}{6}$	$3\frac{1}{2}$ $5\frac{3}{4}$ $9\frac{1}{4}$	$4\frac{7}{10}$ $4\frac{4}{5}$ $9\frac{1}{2}$	$1\frac{1}{4}$ $2\frac{13}{16}$ $4\frac{1}{16}$	$2\frac{5}{12}$ $5\frac{1}{6}$ $7\frac{7}{12}$	$4\frac{1}{2}$ $1\frac{11}{16}$ $6\frac{3}{16}$	$7\frac{5}{8}$ $3\frac{9}{16}$ $11\frac{3}{16}$
4.	$2\frac{5}{8}$ $3\frac{3}{4}$ $6\frac{3}{8}$	$5\frac{1}{2}$ $4\frac{5}{6}$ $10\frac{1}{3}$	$1\frac{1}{2}$ $8\frac{11}{12}$ $10\frac{5}{12}$	$3\frac{9}{10}$ $3\frac{3}{5}$ $7\frac{1}{2}$	$8\frac{3}{8}$ $2\frac{13}{16}$ $11\frac{3}{16}$	$1\frac{3}{4}$ $3\frac{11}{12}$ $5\frac{2}{3}$	$6\frac{11}{12}$ $2\frac{5}{6}$ $9\frac{3}{4}$

Follow development as given in ex. 1. In B and C some pupils may need intervening step: B, $7\frac{17}{16} = 7 + 1\frac{1}{16} = 8\frac{1}{16}$.

Provide further practice in adding unlike fractions.

The Nature Club

1. Miss Black's fifth grade has started a nature club. The boys have built a feeding station for the birds. Last week the birds ate $3\frac{3}{4}$ lb. of seed; this week they ate $4\frac{1}{2}$ lb. How many pounds of seed did they eat in the two weeks? $8\frac{1}{4}$

2. The girls make cookies and sell them to pay for bird seed. One week they made $6\frac{2}{3}$ doz. nut cookies and $5\frac{5}{6}$ doz. sugar cookies. How many dozens did they make that week? $12\frac{1}{2}$

3. In winter the children measure the snowfall. One morning $2\frac{3}{4}$ in. of snow fell and in the afternoon they measured another $1\frac{1}{2}$ in. How many inches of snow fell on that day? $4\frac{1}{4}$

4. Today Danny brought his two young white rats to school. One weighs $8\frac{3}{4}$ oz. and the other weighs $6\frac{1}{2}$ oz. How many ounces do they both weigh? $15\frac{1}{4}$

Add. Check your work by going over it: Have volunteers explain answers.

5.	$6\frac{1}{4}$ $\underline{1\frac{5}{8}}$ $7\frac{7}{8}$	$5\frac{2}{3}$ $\underline{5\frac{5}{6}}$ $11\frac{1}{2}$	$3\frac{9}{10}$ $\underline{2\frac{1}{5}}$ $6\frac{1}{10}$	$1\frac{1}{2}$ $\underline{1\frac{9}{16}}$ $3\frac{1}{16}$	$8\frac{3}{16}$ $\underline{1\frac{5}{8}}$ $9\frac{13}{16}$	$5\frac{7}{10}$ $\underline{7\frac{4}{5}}$ $13\frac{1}{2}$	$5\frac{1}{3}$ $\underline{3\frac{11}{12}}$ $9\frac{1}{4}$
6.	$3\frac{3}{8}$ $\underline{8\frac{1}{2}}$ $11\frac{7}{8}$	$4\frac{1}{6}$ $\underline{5\frac{1}{2}}$ $9\frac{2}{3}$	$3\frac{7}{12}$ $\underline{1\frac{5}{6}}$ $5\frac{5}{12}$	$5\frac{1}{8}$ $\underline{1\frac{15}{16}}$ $7\frac{1}{16}$	$6\frac{1}{2}$ $\underline{6\frac{7}{10}}$ $13\frac{1}{5}$	$4\frac{5}{12}$ $\underline{6\frac{3}{4}}$ $11\frac{1}{6}$	$2\frac{7}{16}$ $\underline{1\frac{7}{8}}$ $4\frac{5}{16}$

More Practice. See ㉚ on page 320. Use to reinforce skill.

Do ex. 1-4 orally with pupils. Then have them complete ex. 5-6 independently. Observe pupils as they work to determine if any have difficulties.

Problems without Questions

Make a good question for each problem so that all the numbers in it are used. Then find the answer to your question:

1. Sam has saved \$4.25. It took him 17 wk. to save that amount.
2. Mrs. Fox needs 5 lb. of meat for a meat loaf. The meat costs \$.69 a pound.
3. Mr. King left New Castle by train at 3:08 P.M. and arrived home at 10:50 P.M. the same day.
4. Jean saves coins in a large piggy bank. She opened her bank yesterday and found 18 quarters, 24 dimes, 13 nickels, and 74 pennies.
5. Fred has saved \$3.75 a month since he started carrying newspapers. He has done this for 2 yr.
6. When Mr. Page drives his car in the country, he averages 42 mi. per hour. Yesterday he drove 2 hr. in the country.
7. Joe took in \$15.40 for the tickets he sold for the school play. Each ticket sold for \$.55.
   ▶ Change \$15.40 to 1540¢ and \$.55 to 55¢.
8. At the food sale last week Mary sold popcorn balls for 8¢ each. When they were all sold she had \$5.20.
9. Ann weighs $64\frac{1}{2}$ lb. and Peggy weighs $59\frac{1}{2}$ lb.
10. On a bicycle trip to Long Mountain, some boys and girls rode 17 mi. in 2 hr.
11. In the last 4 months John has saved \$3.75, \$2.85, \$4.15, and \$3.25 toward a new bicycle.
12. The train that should have arrived at 3:18 P.M. today did not arrive until 3:52 P.M.
13. Mary Ann gave the man in the store a dollar to pay for 2 qt. of milk at 23¢ a quart.
14. Yesterday George worked for Mr. Westbrook from 3:30 P.M. until 5:30 P.M. Mr. Westbrook paid George 55¢ an hour.

Give all pupils opportunity to answer one of the problems as way of determining their understanding of problem patterns and use of problem-solving skills.

Maintain skills in computing with whole numbers.

Mixed Practice

Copy, add, and check:

1. 28, 45, 69, 73, 46, 79 340 — 49, 83, 97, 64, 35, 12 340
2. 57, 92, 19, 74, 35, 63 340 — 25, 72, 69, 84, 57, 76 383
3. 13, 96, 78, 55, 44, 26 312 — 24, 37, 89, 48, 38, 83 319
4. 58, 16, 75, 26, 32, 98 305 — 34, 97, 66, 45, 89, 32 363
5. Find the sum of $12.56, $8.45, $23.50, and $9.57. $54.08
6. Write the number that is 1375 more than 6827. 8202
7. Find the sum: 5371 + 2893 + 546 + 2486 11,296

Subtract and check:

8.	7906	7201	6731	9035	6005	3108
	3363	2587	4564	5762	4598	1528
	4543	4614	2167	3273	1407	1580

9. Find the difference between $320.00 and $165.74. $154.26

10. Write the number that is 657 less than 4280. 3623

Multiply and check your work:

11.	267	5724	3780	853	495	916
	63	18	95	247	309	854
	16,821	103,032	359,100	210,691	152,955	782,264

12. Find the product of 427 and 835; ↖ of 189 and 273. 51,597
356,545

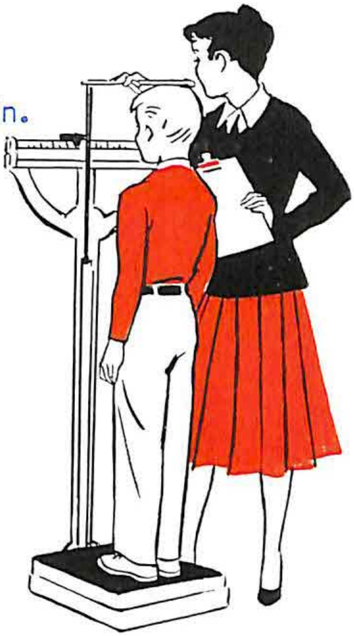
Divide and check your work:

13.	$\begin{array}{r}25\\33\overline{)825}\end{array}$	$\begin{array}{r}6R4\\79\overline{)478}\end{array}$	$\begin{array}{r}88R22\\25\overline{)2222}\end{array}$	$\begin{array}{r}106R18\\47\overline{)5000}\end{array}$	$\begin{array}{r}702R50\\53\overline{)37256}\end{array}$
14.	$\begin{array}{r}8R3\\59\overline{)475}\end{array}$	$\begin{array}{r}8R14\\37\overline{)310}\end{array}$	$\begin{array}{r}38\\69\overline{)2622}\end{array}$	$\begin{array}{r}343R3\\24\overline{)8235}\end{array}$	$\begin{array}{r}818R4\\37\overline{)30270}\end{array}$

15. What is the quotient when you divide 1875 by 25? 75
16. Find the average of 238, 326, 195, 207, and 319. 257
17. Beginning with 3, count by 4's to 67. 3, 7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67
18. Beginning with 8, count by 7's to 71. 8, 15, 22, 29, 36, 43, 50, 57, 64, 71

Correct papers and analyze errors. Discuss errors with pupils to try to find out why they are made. Let others work on magic squares, puzzles, and so on.

Subtracting Unlike Fractions



1. **Problem** George has grown $\frac{7}{8}$ in. since Christmas. Jim has grown $\frac{1}{2}$ in. How much more has George grown than Jim? $\frac{3}{8}$ in.

Explanation The fractions $\frac{7}{8}$ and $\frac{1}{2}$ have different denominators. Before you can subtract them, you must first change them to fractions that have like denominators. Change $\frac{1}{2}$ to $\frac{4}{8}$. Then subtract. George has grown $\frac{3}{8}$ in. more than Jim.

$$\begin{array}{r}\frac{7}{8} = \frac{7}{8}\\ \frac{1}{2} = \frac{4}{8}\\ \hline \frac{3}{8}\end{array}$$

2. Betty tries to practice her music lesson $\frac{3}{4}$ hr. each day. Today she practiced $\frac{1}{2}$ hr. after breakfast. How much longer should she practice today? $\frac{1}{4}$ hr.

Emphasize.

To subtract fractions with different denominators, change them to fractions with like denominators.

In ex. 3-6 be sure pupils do not try to subtract denominators.

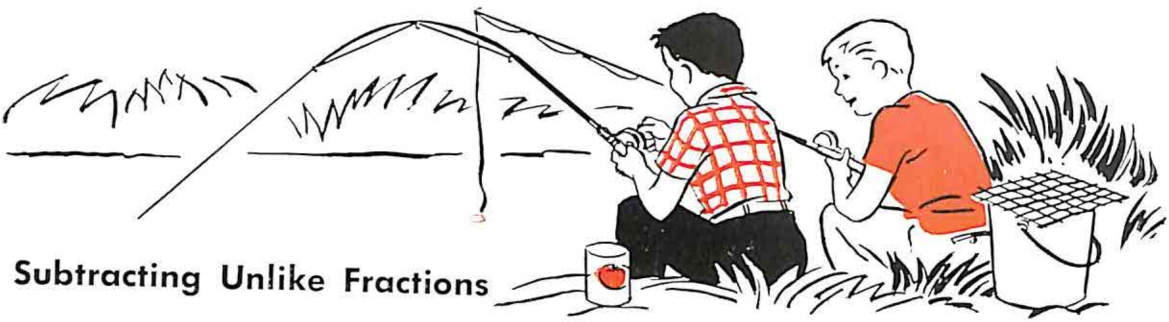
Subtract. Check your work by going over it:

3.	$\begin{array}{c}\frac{5}{6}\\ \frac{1}{3}\\ \hline \frac{1}{2}\end{array}$	$\begin{array}{c}\frac{5}{8}\\ \frac{1}{4}\\ \hline \frac{3}{8}\end{array}$	$\begin{array}{c}\frac{9}{10}\\ \frac{2}{5}\\ \hline \frac{1}{2}\end{array}$	$\begin{array}{c}\frac{13}{16}\\ \frac{3}{4}\\ \hline \frac{1}{16}\end{array}$	$\begin{array}{c}\frac{11}{12}\\ \frac{1}{4}\\ \hline \frac{2}{3}\end{array}$	$\begin{array}{c}\frac{4}{5}\\ \frac{1}{10}\\ \hline \frac{7}{10}\end{array}$	$\begin{array}{c}\frac{11}{16}\\ \frac{1}{2}\\ \hline \frac{3}{16}\end{array}$	$\begin{array}{c}\frac{1}{2}\\ \frac{3}{10}\\ \hline \frac{1}{5}\end{array}$	$\begin{array}{c}\frac{15}{16}\\ \frac{5}{8}\\ \hline \frac{5}{16}\end{array}$
4.	$\begin{array}{c}\frac{7}{8}\\ \frac{3}{4}\\ \hline \frac{1}{8}\end{array}$	$\begin{array}{c}\frac{1}{2}\\ \frac{1}{8}\\ \hline \frac{3}{8}\end{array}$	$\begin{array}{c}\frac{11}{12}\\ \frac{3}{4}\\ \hline \frac{1}{6}\end{array}$	$\begin{array}{c}\frac{1}{5}\\ \frac{1}{10}\\ \hline \frac{1}{10}\end{array}$	$\begin{array}{c}\frac{9}{16}\\ \frac{1}{4}\\ \hline \frac{5}{16}\end{array}$	$\begin{array}{c}\frac{7}{12}\\ \frac{1}{3}\\ \hline \frac{1}{4}\end{array}$	$\begin{array}{c}\frac{13}{16}\\ \frac{5}{8}\\ \hline \frac{3}{16}\end{array}$	$\begin{array}{c}\frac{11}{12}\\ \frac{1}{3}\\ \hline \frac{7}{12}\end{array}$	$\begin{array}{c}\frac{5}{8}\\ \frac{1}{16}\\ \hline \frac{9}{16}\end{array}$
5.	$\begin{array}{c}\frac{3}{4}\\ \frac{5}{8}\\ \hline \frac{1}{8}\end{array}$	$\begin{array}{c}\frac{7}{8}\\ \frac{1}{4}\\ \hline \frac{5}{8}\end{array}$	$\begin{array}{c}\frac{1}{3}\\ \frac{1}{12}\\ \hline \frac{1}{4}\end{array}$	$\begin{array}{c}\frac{9}{10}\\ \frac{1}{2}\\ \hline \frac{2}{5}\end{array}$	$\begin{array}{c}\frac{3}{4}\\ \frac{5}{16}\\ \hline \frac{7}{16}\end{array}$	$\begin{array}{c}\frac{3}{4}\\ \frac{7}{12}\\ \hline \frac{1}{6}\end{array}$	$\begin{array}{c}\frac{15}{16}\\ \frac{3}{8}\\ \hline \frac{9}{16}\end{array}$	$\begin{array}{c}\frac{3}{5}\\ \frac{3}{10}\\ \hline \frac{3}{10}\end{array}$	$\begin{array}{c}\frac{3}{4}\\ \frac{7}{16}\\ \hline \frac{5}{16}\end{array}$

6. Which is larger, $\frac{1}{3}$ or $\frac{5}{12}$? How much larger? $\frac{5}{12}$ is $\frac{1}{12}$ larger.

More Practice. See ㉛ on page 320.

Review subtraction of like fractions. Stress that only numerators are subtracted since denominators name the fractions. Then do ex. 1. Emphasize changing of fractions to ones with like denominators.



Subtracting Unlike Fractions

1. **Problem** Jack caught a fish that weighed $3\frac{1}{2}$ lb. George caught one that weighed $2\frac{1}{8}$ lb. How much heavier was Jack's fish than George's fish? $1\frac{3}{8}$ lb.

Explanation The common denominator is 8. Change $\frac{1}{2}$ to $\frac{4}{8}$; then subtract as shown at the right. The difference is $1\frac{3}{8}$. Jack's fish was $1\frac{3}{8}$ lb. heavier than George's.

$$\begin{array}{rcr} 3\frac{1}{2} & = & 3\frac{4}{8} \\ \underline{2\frac{1}{8}} & = & \underline{2\frac{1}{8}} \\ & & 1\frac{3}{8} \end{array}$$

2. At a sale Mrs. Green bought a piece of cloth that was $5\frac{7}{8}$ yd. long. She used $2\frac{1}{4}$ yd. of it for a dress for Sally. How much cloth did she have left in the piece? $3\frac{5}{8}$ yd.

3. Jack's music teacher wants him to practice $5\frac{1}{2}$ hr. this week. So far Jack has practiced $3\frac{1}{4}$ hr. How many more hours should Jack practice? $2\frac{1}{4}$

Subtract. Check by going over your work:

4.	$7\frac{3}{4}$ $5\frac{3}{8}$ $2\frac{3}{8}$	$9\frac{1}{3}$ $3\frac{1}{6}$ $6\frac{1}{6}$	$5\frac{9}{16}$ $1\frac{1}{8}$ $4\frac{7}{16}$	$8\frac{7}{10}$ $6\frac{2}{5}$ $2\frac{3}{10}$	$4\frac{3}{4}$ $1\frac{11}{16}$ $3\frac{1}{16}$	$3\frac{11}{12}$ $2\frac{5}{6}$ $1\frac{1}{12}$	$9\frac{15}{16}$ $8\frac{7}{8}$ $1\frac{1}{16}$
5.	$6\frac{7}{8}$ $4\frac{3}{4}$ $2\frac{1}{8}$	$2\frac{5}{6}$ $\frac{1}{2}$ $2\frac{1}{3}$	$9\frac{2}{3}$ $5\frac{1}{12}$ $4\frac{7}{12}$	$4\frac{9}{10}$ $2\frac{2}{5}$ $2\frac{1}{2}$	$1\frac{5}{12}$ $\frac{1}{4}$ $1\frac{1}{6}$	$7\frac{11}{16}$ $3\frac{3}{8}$ $4\frac{5}{16}$	$5\frac{7}{12}$ $4\frac{1}{3}$ $1\frac{1}{4}$
6.	$9\frac{3}{4}$ $7\frac{1}{2}$ $2\frac{1}{4}$	$3\frac{5}{6}$ $1\frac{2}{3}$ $2\frac{1}{6}$	$8\frac{3}{5}$ $4\frac{3}{10}$ $4\frac{3}{10}$	$7\frac{1}{2}$ $3\frac{7}{16}$ $4\frac{1}{16}$	$5\frac{4}{5}$ $2\frac{3}{10}$ $3\frac{1}{2}$	$9\frac{13}{16}$ $6\frac{1}{2}$ $3\frac{5}{16}$	$6\frac{5}{8}$ $3\frac{7}{16}$ $3\frac{3}{16}$

7. Subtract $3\frac{5}{16}$ from each: $9\frac{3}{4}$ $6\frac{7}{16}$ $3\frac{3}{8}$ $\frac{1}{16}$ $5\frac{7}{8}$ $2\frac{9}{16}$ $7\frac{1}{2}$ $4\frac{3}{16}$ $6\frac{5}{8}$ $3\frac{5}{16}$

8. Subtract $1\frac{1}{6}$ from each: $6\frac{1}{2}$ $5\frac{1}{3}$ $7\frac{11}{12}$ $6\frac{3}{4}$ $4\frac{2}{3}$ $3\frac{1}{2}$ $8\frac{5}{12}$ $7\frac{1}{4}$ $3\frac{7}{12}$ $2\frac{5}{12}$

9. Subtract $2\frac{3}{8}$ from each: $5\frac{1}{2}$ $3\frac{1}{8}$ $4\frac{15}{16}$ $2\frac{9}{16}$ $6\frac{3}{4}$ $4\frac{3}{8}$ $2\frac{9}{16}$ $\frac{3}{16}$ $9\frac{7}{16}$ $7\frac{1}{16}$

Do ex. 1-3 with pupils, emphasizing that after changing fractions to like ones, we subtract the fractions first, then whole numbers. Be sure pupils do work as shown in ex. 1.

Maintain computation skills in whole numbers.

Keeping in Practice

Divide. Check the work by multiplying:

1.	$\begin{array}{r} 89 \\ 42\overline{)3738} \end{array}$	$\begin{array}{r} 734\text{R8} \\ 39\overline{)28634} \end{array}$	$\begin{array}{r} 992 \\ 24\overline{)23808} \end{array}$	$\begin{array}{r} 932 \\ 17\overline{)15844} \end{array}$
2.	$\begin{array}{r} 140 \\ 59\overline{)8260} \end{array}$	$\begin{array}{r} 639\text{R10} \\ 28\overline{)17902} \end{array}$	$\begin{array}{r} 575\text{R32} \\ 34\overline{)19582} \end{array}$	$\begin{array}{r} 602\text{R2} \\ 51\overline{)30704} \end{array}$
3.	$\begin{array}{r} 323 \\ 25\overline{)8075} \end{array}$	$\begin{array}{r} 454 \\ 37\overline{)16798} \end{array}$	$\begin{array}{r} 322 \\ 45\overline{)14490} \end{array}$	$\begin{array}{r} 812\text{R13} \\ 16\overline{)13005} \end{array}$
4.	$\begin{array}{r} 152 \\ 18\overline{)2736} \end{array}$	$\begin{array}{r} 994\text{R8} \\ 22\overline{)21876} \end{array}$	$\begin{array}{r} 224 \\ 47\overline{)10528} \end{array}$	$\begin{array}{r} 931 \\ 29\overline{)26999} \end{array}$

Subtract and check the work:

5.	$\begin{array}{r} 90667 \\ 28952 \\ \hline 61{,}715 \end{array}$	$\begin{array}{r} 88474 \\ 58466 \\ \hline 30{,}008 \end{array}$	$\begin{array}{r} 37635 \\ 29136 \\ \hline 8499 \end{array}$	$\begin{array}{r} 50000 \\ 36412 \\ \hline 13{,}588 \end{array}$	$\begin{array}{r} 48064 \\ 13059 \\ \hline 35{,}005 \end{array}$
6.	$\begin{array}{r} 85933 \\ 48205 \\ \hline 37{,}728 \end{array}$	$\begin{array}{r} 93573 \\ 71274 \\ \hline 22{,}299 \end{array}$	$\begin{array}{r} 92573 \\ 19226 \\ \hline 73{,}347 \end{array}$	$\begin{array}{r} 84281 \\ 58617 \\ \hline 25{,}664 \end{array}$	$\begin{array}{r} 70135 \\ 33623 \\ \hline 36{,}512 \end{array}$

Multiply and check the work:

7.	239 × 560 133,840	487 × 486 236,682	304 × 799 ✓ 242,896
8.	520 × 647 336,440	185 × 530 98,050	472 × 623 ✓ 294,056
9.	464 × 510 236,640	260 × 965 250,900	971 × 981 ✓ 952,551
10.	356 × 381 135,636	619 × 742 459,298	195 × 389 75,855
11.	897 × 507 454,779	358 × 921 329,718	682 × 819 ✓ 558,558

Add up. Check the work by adding down:

12.	$\begin{array}{r} \$144.17 \\ 230.46 \\ 46.84 \\ 115.72 \\ 283.00 \\ \hline \$820.19 \end{array}$	$\begin{array}{r} \$103.38 \\ 89.90 \\ 212.89 \\ 293.54 \\ 180.09 \\ \hline \$879.80 \end{array}$	$\begin{array}{r} \$406.59 \\ 171.47 \\ 95.14 \\ 79.36 \\ 160.57 \\ \hline \$913.13 \end{array}$	$\begin{array}{r} \$250.36 \\ 87.68 \\ 58.87 \\ 856.75 \\ 146.34 \\ \hline \$1400.00 \end{array}$	$\begin{array}{r} \$793.53 \\ 426.44 \\ 66.59 \\ 623.22 \\ 297.56 \\ \hline \$2207.34 \end{array}$

Find the sum:

13. 15 + 24 + 96 + 71 + 17 + 85 + 92 400 7216 + 1976 9192

14. 85 + 12 + 69 + 30 + 54 + 20 + 45 315 4795 + 2405 7200

Plan remedial activities as needed. See suggestions for page 194 also.

Before doing ex. 1-10 review with pupils different uses of addition, subtraction, multiplication, and division in problem solving.

Problems without Numbers

Tell whether you add, subtract, multiply, or divide to work each problem. If there are two steps, tell what you do for each step:

1. You know Ann's age and how many years older her sister Betty is. How do you find Betty's age? Add
2. You know how many tickets have been printed for the school circus. You also know how many children will sell tickets. How do you find the number each child should sell? Divide
3. You know the cost of each thing you bought at the store. How do you find the amount you spent all together? Add
4. You know how many miles it is between two towns and the number of hours your father drove to make the trip. How do you find the average speed of the car? Divide
5. You know the number of inches of ribbon you need to sew on your new skirt. How do you find the number of yards of ribbon you need? Divide
6. You know the cost of a yard of cloth, the number of yards you will buy, and the amount of money you will give the man. How do you find the change you should get? Multiply; subtract
7. You know how many eggs you got from your hens this week. You also know how many of these eggs you sold. How do you find how many eggs you had left? Subtract
8. You know the price of each of two ball gloves. How do you find the difference in their prices? Subtract
9. You know the price of a quart of milk and the number of quarts your mother buys each week. You also know that she buys the same number of quarts of milk each week. How do you find the cost of milk for several weeks? Multiply; multiply
10. You know the cost of each of five things for a picnic lunch and also how many girls will share the cost equally. How do you find each girl's share of the cost? Add; divide

Let pupils supply own numbers to complete problems. Let different pupils read their problems for class to solve.

Review vocabulary words which are basic to arithmetic vocabulary for Grade 5.

Do You Know the Right Word?

Read the statements below and tell the correct word to put in each space. Do not write in the spaces:

1. A whole number followed by a proper fraction is called a mixed number.

2. To find the difference between two numbers, you subtract.

3. The money you receive after you have paid for something you have bought is called change.

4. In an example in addition, the answer is called the sum.

5. When an orange is divided into four equal parts, each part is called one fourth of the orange.

6. When the speed of an airplane is multiplied by the number of hours it travels, the answer stands for the distance.

7. In writing dollars and cents, the dot that separates the dollars from the cents is called the decimal point.

8. In an example in division, the number that is divided is called the dividend; the number by which you divide is called the divisor; the answer is called the quotient. If there is anything left over, it is called the remainder.

9. In a fraction, the number above the line is called the numerator; the number below the line is called the denominator. Both numbers are called the terms of the fraction.

10. In an example in multiplication, the number that is multiplied is called the multiplicand; the number by which you multiply is called the multiplier; the answer is called the product.

11. In an example in subtraction, the number to be subtracted is called the subtrahend; the number from which you subtract is called the minuend; the answer is called the remainder or the difference.

12. To change an improper fraction to a whole number or to a mixed number, divide its numerator by its denominator.

If some pupils cannot recall correct words (unaided recall), provide small cards with these words on them. Pupils may use them to match a word with a statement (aided recall). See page 29 also.

Teach how to add and subtract fractions when common denominator is not denominator of original fractions.

Making Candy

1. **Problem** Susan wants to make chocolate candy and peanut butter candy for a party. She needs $\frac{2}{3}$ cup of milk for the chocolate candy and $\frac{1}{2}$ cup of milk for the peanut butter candy. When Susan looked at the milk bottle she was not sure she had enough milk for both kinds of candy. How many cups of milk does she need all together? $1\frac{1}{6}$

Explanation To find out you must add $\frac{2}{3}$ and $\frac{1}{2}$. Before you can add $\frac{2}{3}$ and $\frac{1}{2}$, you must change them to fractions having the same denominator. You cannot change $\frac{2}{3}$ to **halves** and you cannot change $\frac{1}{2}$ to **thirds.** But you can change both fractions to **sixths,** so 6 will be the common denominator. 6 is a number large enough to be divided exactly by both 3 and 2. You see that 6 is the product of 3 and 2. How do you change $\frac{2}{3}$ to $\frac{4}{6}$? How do you change $\frac{1}{2}$ to $\frac{3}{6}$? When you add $\frac{4}{6}$ and $\frac{3}{6}$ you get $1\frac{1}{6}$. Susan needs $1\frac{1}{6}$ cups of milk.

$$\begin{aligned} \tfrac{2}{3} &= \tfrac{4}{6} \\ \tfrac{1}{2} &= \underline{\tfrac{3}{6}} \\ \tfrac{7}{6} &= 1\tfrac{1}{6} \end{aligned}$$

2. In ex. 1 both denominators 3 and 2 are **factors** of the common denominator 6. When you add unlike fractions each of their denominators must be a factor of the common denominator you use. Why? If you cannot see a common denominator for two fractions quickly, you can always get one by **multiplying the two denominators together.** Stress.

In ex. 1 have pupils refer to chart of fractions (page 186) to discover that $\frac{1}{2}$ and $\frac{2}{3}$ can be expressed as sixths. Be sure they understand how to change $\frac{2}{3}$ to $\frac{4}{6}$ and $\frac{1}{2}$ to $\frac{3}{6}$ and why denominators must be factors of common denominator.

Continue work of page 200; extend to mixed numbers.

Adding and Subtracting Fractions

Add. Check your work by going over it:

1.	$\begin{array}{r}\frac{1}{2}\\ \underline{\frac{2}{3}}\\ 1\frac{1}{6}\end{array}$	$\begin{array}{r}\frac{1}{3}\\ \underline{\frac{3}{4}}\\ 1\frac{1}{12}\end{array}$	$\begin{array}{r}1\frac{1}{2}\\ \underline{1\frac{2}{5}}\\ 2\frac{9}{10}\end{array}$	$\begin{array}{r}4\frac{1}{3}\\ \underline{8\frac{4}{5}}\\ 13\frac{2}{15}\end{array}$	$\begin{array}{r}2\frac{2}{3}\\ \underline{1\frac{5}{8}}\\ 4\frac{7}{24}\end{array}$	$\begin{array}{r}3\frac{1}{2}\\ \underline{3\frac{4}{5}}\\ 7\frac{3}{10}\end{array}$	$\begin{array}{r}5\frac{1}{4}\\ \underline{4\frac{1}{3}}\\ 9\frac{7}{12}\end{array}$	$\begin{array}{r}6\frac{2}{3}\\ \underline{1\frac{3}{4}}\\ 8\frac{5}{12}\end{array}$
2.	$\begin{array}{r}\frac{1}{4}\\ \underline{\frac{2}{3}}\\ \frac{11}{12}\end{array}$	$\begin{array}{r}\frac{1}{3}\\ \underline{\frac{1}{2}}\\ \frac{5}{6}\end{array}$	$\begin{array}{r}3\frac{1}{3}\\ \underline{1\frac{1}{4}}\\ 4\frac{7}{12}\end{array}$	$\begin{array}{r}4\frac{3}{4}\\ \underline{3\frac{1}{3}}\\ 8\frac{1}{12}\end{array}$	$\begin{array}{r}3\frac{1}{2}\\ \underline{6\frac{1}{3}}\\ 9\frac{5}{6}\end{array}$	$\begin{array}{r}5\frac{2}{3}\\ \underline{2\frac{1}{2}}\\ 8\frac{1}{6}\end{array}$	$\begin{array}{r}9\frac{1}{3}\\ \underline{3\frac{2}{5}}\\ 12\frac{11}{15}\end{array}$	$\begin{array}{r}7\frac{1}{2}\\ \underline{4\frac{3}{5}}\\ 12\frac{1}{10}\end{array}$
3.	$\begin{array}{r}\frac{1}{5}\\ \underline{\frac{1}{2}}\\ \frac{7}{10}\end{array}$	$\begin{array}{r}\frac{3}{4}\\ \underline{\frac{2}{3}}\\ 1\frac{5}{12}\end{array}$	$\begin{array}{r}2\frac{3}{5}\\ \underline{2\frac{1}{2}}\\ 5\frac{1}{10}\end{array}$	$\begin{array}{r}2\frac{1}{2}\\ \underline{5\frac{1}{5}}\\ 7\frac{7}{10}\end{array}$	$\begin{array}{r}4\frac{1}{3}\\ \underline{6\frac{3}{8}}\\ 10\frac{17}{24}\end{array}$	$\begin{array}{r}2\frac{2}{3}\\ \underline{9\frac{1}{4}}\\ 11\frac{11}{12}\end{array}$	$\begin{array}{r}5\frac{1}{2}\\ \underline{5\frac{3}{5}}\\ 11\frac{1}{10}\end{array}$	$\begin{array}{r}1\frac{2}{3}\\ \underline{4\frac{4}{5}}\\ 6\frac{7}{15}\end{array}$

4. **Problem** Mrs. White had $4\frac{3}{4}$ yd. of cloth. She used $2\frac{2}{3}$ yd. for Sally's dress. How many yards were left in the piece? $2\frac{1}{12}$

Explanation You know fractions must have a common denominator if you wish to subtract them. You cannot change thirds to fourths nor fourths to thirds. You can find a common denominator by multiplying the two denominators together, which gives 12. Subtract as shown at the right. There will be $2\frac{1}{12}$ yd. left.

$$\begin{array}{rcr}4\frac{3}{4} & = & 4\frac{9}{12}\\ 2\frac{2}{3} & = & \underline{2\frac{8}{12}}\\ & & 2\frac{1}{12}\end{array}$$

5. Andy had $6\frac{2}{3}$ doz. eggs to sell. He sold $2\frac{1}{2}$ doz. to Mr. Green. How many dozen eggs did Andy have left? $4\frac{1}{6}$

Have pupils explain how they found common denominator and changed the fractions.

Subtract. Check by going over your work:

6.	$\begin{array}{r}\frac{1}{2}\\ \underline{\frac{1}{3}}\\ \frac{1}{6}\end{array}$	$\begin{array}{r}\frac{2}{3}\\ \underline{\frac{1}{4}}\\ \frac{5}{12}\end{array}$	$\begin{array}{r}4\frac{1}{2}\\ \underline{2\frac{2}{5}}\\ 2\frac{1}{10}\end{array}$	$\begin{array}{r}9\frac{3}{4}\\ \underline{1\frac{2}{3}}\\ 8\frac{1}{12}\end{array}$	$\begin{array}{r}3\frac{5}{8}\\ \underline{2\frac{1}{3}}\\ 1\frac{7}{24}\end{array}$	$\begin{array}{r}8\frac{4}{5}\\ \underline{5\frac{1}{2}}\\ 3\frac{3}{10}\end{array}$	$\begin{array}{r}6\frac{1}{3}\\ \underline{4\frac{1}{4}}\\ 2\frac{1}{12}\end{array}$	$\begin{array}{r}9\frac{2}{5}\\ \underline{4\frac{1}{3}}\\ 5\frac{1}{15}\end{array}$
7.	$\begin{array}{r}\frac{2}{3}\\ \underline{\frac{3}{8}}\\ \frac{7}{24}\end{array}$	$\begin{array}{r}\frac{4}{5}\\ \underline{\frac{2}{3}}\\ \frac{2}{15}\end{array}$	$\begin{array}{r}6\frac{2}{3}\\ \underline{3\frac{3}{5}}\\ 3\frac{1}{15}\end{array}$	$\begin{array}{r}7\frac{1}{3}\\ \underline{4\frac{1}{5}}\\ 3\frac{2}{15}\end{array}$	$\begin{array}{r}4\frac{7}{8}\\ \underline{1\frac{2}{3}}\\ 3\frac{5}{24}\end{array}$	$\begin{array}{r}8\frac{2}{3}\\ \underline{7\frac{5}{8}}\\ 1\frac{1}{24}\end{array}$	$\begin{array}{r}5\frac{1}{2}\\ \underline{\frac{1}{5}}\\ 5\frac{3}{10}\end{array}$	$\begin{array}{r}3\frac{2}{3}\\ \underline{1\frac{1}{8}}\\ 2\frac{13}{24}\end{array}$
8.	$\begin{array}{r}\frac{2}{3}\\ \underline{\frac{1}{2}}\\ \frac{1}{6}\end{array}$	$\begin{array}{r}\frac{2}{3}\\ \underline{\frac{1}{8}}\\ \frac{13}{24}\end{array}$	$\begin{array}{r}8\frac{4}{5}\\ \underline{2\frac{1}{3}}\\ 6\frac{7}{15}\end{array}$	$\begin{array}{r}5\frac{3}{8}\\ \underline{4\frac{1}{3}}\\ 1\frac{1}{24}\end{array}$	$\begin{array}{r}5\frac{1}{3}\\ \underline{2\frac{1}{8}}\\ 3\frac{5}{24}\end{array}$	$\begin{array}{r}9\frac{2}{3}\\ \underline{6\frac{1}{5}}\\ 3\frac{7}{15}\end{array}$	$\begin{array}{r}7\frac{3}{4}\\ \underline{2\frac{1}{3}}\\ 5\frac{5}{12}\end{array}$	$\begin{array}{r}8\frac{7}{8}\\ \underline{6\frac{1}{3}}\\ 2\frac{13}{24}\end{array}$

More Practice. See ㉜ on page 321. Use for individual assistance.

Do ex. 1 with pupils, emphasizing that both fractions must be changed to fractions with common denominator. Urge pupils to find common denominator by inspection where possible.

Present review of fraction skills, measures, Roman numerals, and number concepts.

Oral Review

1. Change each fraction to a mixed number:

$\frac{5}{4}$ $1\frac{1}{4}$ $\frac{6}{5}$ $1\frac{1}{5}$ $\frac{9}{8}$ $1\frac{1}{8}$ $\frac{8}{3}$ $2\frac{2}{3}$ $\frac{10}{3}$ $3\frac{1}{3}$ $\frac{17}{5}$ $3\frac{2}{5}$ $\frac{11}{4}$ $2\frac{3}{4}$ $\frac{15}{7}$ $2\frac{1}{7}$ $\frac{25}{6}$ $4\frac{1}{6}$

2. Change each fraction to lowest terms:

$\frac{3}{6}$ $\frac{1}{2}$ $\frac{6}{8}$ $\frac{3}{4}$ $\frac{2}{4}$ $\frac{1}{2}$ $\frac{4}{6}$ $\frac{2}{3}$ $\frac{10}{12}$ $\frac{5}{6}$ $\frac{4}{14}$ $\frac{2}{7}$ $\frac{5}{15}$ $\frac{1}{3}$ $\frac{12}{18}$ $\frac{2}{3}$ $\frac{15}{20}$ $\frac{3}{4}$

3. Add 4 to each number; (1) add 5; (2) add 7; (3) add 8: (4)

(1),(2) 47,48 76,77 90,91 32,33 58,59 23,24 71,72 39,40
(3) 43 50 72 79 86 93 28 35 54 61 19 26 67 74 35 42
(4) 51 80 94 36 62 27 75 43

4. Subtract 5 from each number; (1) subtract 9; (2) subtract 10: (3)

(1) 64 82 23 85 31 68 40 47
(2) 69 60 87 78 28 19 90 81 36 27 73 64 45 36 52 43
(3) 59 77 18 80 26 63 35 42

5. Find the difference between $7\frac{5}{8}$ and $4\frac{1}{8}$. $3\frac{1}{2}$

6. Find the cost of 3 balls at 15¢ each. 45¢

7. Mary Ann bought 2 large apples for 9¢. What was the cost of 1 apple? $4\frac{1}{2}$¢

8. How many bushels are there in 12 pk.? 3 in 16 pk.? 4

9. Count by 6's from 23 to 89; (1) from 44 to 86. (2) (1) 23, 29, 35, 41, 47, 53, 59, 65, 71, 77, 83, 89; (2) 44, 50, 56, 62, 68, 74, 80, 86

10. Count by 9's from 32 to 95; (1) from 113 to 185. (2) (1) 32, 41, 50, 59, 68, 77, 86, 95; (2) 113, 122, 131, 140, 149, 158, 167, 176, 185

11. Tell what coins you would get as change for $1.00 if you bought things for these amounts:

60¢ 1 nickel, 1 dime, 1 quarter
43¢ 2 pennies, 1 nickel, 1 half dollar
15¢ 1 dime, 1 quarter, 1 half dollar
39¢ 1 penny, 1 dime, 1 half dollar
58¢ 2 pennies, 1 nickel, 1 dime, 1 quarter
22¢ 3 pennies, 1 quarter, 1 half dollar
77¢ 3 pennies, 2 dimes

12. How many zeros are there in the number 7 million? 6

13. How many zeros are there in the number 80 million? 7

14. Jim rides his bicycle at the rate of 10 mi. an hour. How far can he ride in $\frac{1}{2}$ hr.? 5 mi. in 2 hr.? 20 mi.

15. Find the sum of 2, 4, 5, 3, 6, and 7. 27

16. How many pounds are there in 1 ton? 2000 in $\frac{1}{2}$ ton? 1000

17. How many inches are there in 2 ft. 6 in.? 30 in 5 ft.? 60

18. Which is larger, $\frac{2}{3}$ of 24 or $\frac{3}{4}$ of 24? $\frac{3}{4}$ of 24 is larger.

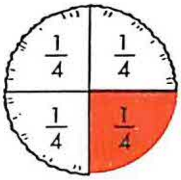
19. Read these numbers: LXIV, 64 CXL, 1 hundred, 40 MCML, 1 thousand, 9 hundred, 50 MCMLIX. 1 thousand, 9 hundred, 59

Let different pupils act as teacher, calling on others. Use review to spot-check for class or individual weaknesses. Provide further review, reteaching, or drill as needed.

Teach subtraction of fraction from whole number 1. Use fractional parts in discussion of ex. 1-3.

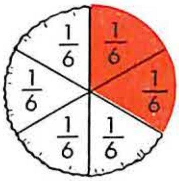
Subtracting Fractions

1. Mrs. Lane cut an apple pie into 4 equal pieces. She gave Mr. Lane $\frac{1}{4}$ of it for his lunch. How much of the pie was left? $\frac{3}{4}$



$$\begin{array}{r} 1 \text{ pie} = \frac{4}{4} \text{ pie} \\ \underline{\frac{1}{4} \text{ pie}} \\ \frac{3}{4} \text{ pie} \end{array}$$

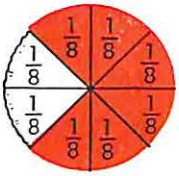
2. Mrs. White cut her apple pie into sixths. She gave Fred and Mary Ann each a piece of pie. How much pie did she have left? $\frac{4}{6}$, or $\frac{2}{3}$



$$\begin{array}{r} 1 \text{ pie} = \frac{6}{6} \text{ pie} \\ \underline{\frac{2}{6} \text{ pie}} \\ \frac{4}{6} \text{ pie} \end{array}$$

$\frac{4}{6}$ pie = $\frac{2}{3}$ pie

3. Bill's mother cut her apple pie into eighths. She gave Bill and his 5 friends each a piece. How much of her pie was left? $\frac{2}{8}$, or $\frac{1}{4}$



$$\begin{array}{r} 1 \text{ pie} = \frac{8}{8} \text{ pie} \\ \underline{\frac{6}{8} \text{ pie}} \\ \frac{2}{8} \text{ pie} \end{array}$$

$\frac{2}{8}$ pie = $\frac{1}{4}$ pie

In ex. 1-3, ask pupils why wholes were changed to $\frac{4}{4}$, $\frac{6}{6}$, $\frac{8}{8}$.

Tell what number should be put in each numerator:

4. $1 = \frac{?}{10}$ 10 $1 = \frac{?}{16}$ 16 $1 = \frac{?}{3}$ 3 $1 = \frac{?}{5}$ 5 $1 = \frac{?}{12}$ 12 $1 = \frac{?}{7}$ 7

5. Patty has 1 yd. of cloth for dolls' clothes. If she uses $\frac{1}{4}$ yd. for a skirt, how much cloth will be left? $\frac{3}{4}$ yd.

6. Jack had 1 large apple. He gave $\frac{1}{2}$ of it to Tom. What part of the apple did Jack have left? $\frac{1}{2}$

7. Mary gave $\frac{2}{3}$ of her candy bar to Ann and Bob. What part of the candy bar did she have for herself? $\frac{1}{3}$

8. What does the denominator of the fraction in ex. 7 mean? 3 parts What does the numerator of the same fraction mean? 2 parts

Be sure pupils understand that 1 must be changed to same size parts as are being subtracted.

Subtract these numbers:

9. $\begin{array}{r} 1 \\ \underline{\frac{3}{5}} \\ \frac{2}{5} \end{array}$ $\begin{array}{r} 1 \\ \underline{\frac{5}{8}} \\ \frac{3}{8} \end{array}$ $\begin{array}{r} 1 \\ \underline{\frac{2}{5}} \\ \frac{3}{5} \end{array}$ $\begin{array}{r} 1 \\ \underline{\frac{2}{3}} \\ \frac{1}{3} \end{array}$ $\begin{array}{r} 1 \\ \underline{\frac{5}{6}} \\ \frac{1}{6} \end{array}$ $\begin{array}{r} 1 \\ \underline{\frac{7}{8}} \\ \frac{1}{8} \end{array}$ $\begin{array}{r} 1 \\ \underline{\frac{5}{16}} \\ \frac{11}{16} \end{array}$ $\begin{array}{r} 1 \\ \underline{\frac{11}{12}} \\ \frac{1}{12} \end{array}$

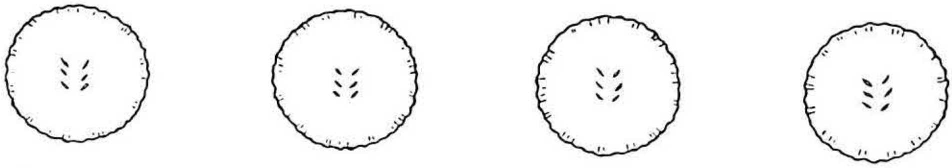
More Practice. See ㉝ on page 321.

Review first, using materials or drawings, that size and number of equal parts that make up a whole depend on number of equal parts into which whole has been divided. Then follow development as given on page.

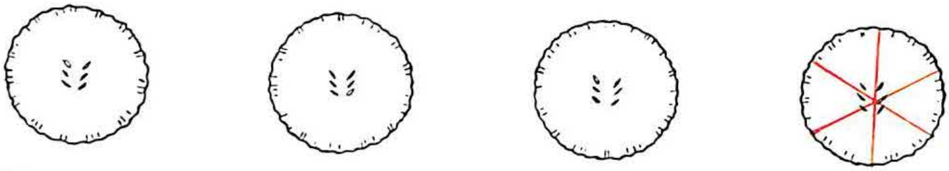
Teach subtraction of fractions and mixed numbers from whole numbers. Stress that the 1 to be regrouped must be changed to same size parts as are being subtracted.

Subtracting Fractions

1. Here are four whole pies:



If you cut one of the pies into sixths, as shown below, you will have 3 whole pies and $\frac{6}{6}$ of another pie.



You see that the 4 pies with which you started are the same as $3\frac{6}{6}$ pies. This shows that $4 = 3\frac{6}{6}$.

2. Draw 3 pies. Then divide one of the pies into fourths. Show that 3 pies are the same as 2 pies and $\frac{4}{4}$ of another pie. Does $3 = 2\frac{4}{4}$? Yes

3. **Problem** Mother had 4 cups of milk. She used $1\frac{3}{4}$ cups for soup. How many cups of milk did she have left? $2\frac{1}{4}$

Explanation Change 4 to $3\frac{4}{4}$. First subtract $\frac{3}{4}$ from $\frac{4}{4}$, which leaves $\frac{1}{4}$. Then subtract 1 from 3, which leaves 2. Mother had $2\frac{1}{4}$ cups left.

$$\begin{array}{rcr} 4 & = & 3\frac{4}{4} \\ 1\frac{3}{4} & = & 1\frac{3}{4} \\ \hline & & 2\frac{1}{4} \end{array}$$

In ex. 4–6 be sure pupils properly expressed whole numbers in minuend in new mixed-number form.

Subtract. Check your work by going over it:

4.	$\begin{array}{r}7\\ \frac{3}{8}\\ \hline 6\frac{5}{8}\end{array}$	$\begin{array}{r}9\\ \frac{4}{5}\\ \hline 8\frac{1}{5}\end{array}$	$\begin{array}{r}5\\ 2\frac{2}{3}\\ \hline 2\frac{1}{3}\end{array}$	$\begin{array}{r}3\\ 1\frac{1}{6}\\ \hline 1\frac{5}{6}\end{array}$	$\begin{array}{r}8\\ 4\frac{5}{8}\\ \hline 3\frac{3}{8}\end{array}$	$\begin{array}{r}4\\ 2\frac{11}{16}\\ \hline 1\frac{5}{16}\end{array}$	$\begin{array}{r}2\\ 1\frac{7}{10}\\ \hline \frac{3}{10}\end{array}$
5.	$\begin{array}{r}6\\ \frac{3}{4}\\ \hline 5\frac{1}{4}\end{array}$	$\begin{array}{r}8\\ \frac{5}{6}\\ \hline 7\frac{1}{6}\end{array}$	$\begin{array}{r}2\\ 1\frac{1}{5}\\ \hline \frac{4}{5}\end{array}$	$\begin{array}{r}9\\ 6\frac{5}{8}\\ \hline 2\frac{3}{8}\end{array}$	$\begin{array}{r}5\\ 3\frac{1}{3}\\ \hline 1\frac{2}{3}\end{array}$	$\begin{array}{r}7\\ 6\frac{7}{12}\\ \hline \frac{5}{12}\end{array}$	$\begin{array}{r}6\\ 3\frac{3}{16}\\ \hline 2\frac{13}{16}\end{array}$
6.	$\begin{array}{r}9\\ \frac{7}{8}\\ \hline 8\frac{1}{8}\end{array}$	$\begin{array}{r}4\\ \frac{3}{5}\\ \hline 3\frac{2}{5}\end{array}$	$\begin{array}{r}7\\ 4\frac{1}{4}\\ \hline 2\frac{3}{4}\end{array}$	$\begin{array}{r}3\\ 2\frac{1}{8}\\ \hline \frac{7}{8}\end{array}$	$\begin{array}{r}8\\ 6\frac{2}{5}\\ \hline 1\frac{3}{5}\end{array}$	$\begin{array}{r}6\\ 1\frac{9}{16}\\ \hline 4\frac{7}{16}\end{array}$	$\begin{array}{r}5\\ 4\frac{11}{12}\\ \hline \frac{1}{12}\end{array}$

More Practice. See ㉞ on page 321.

Illustrate ex. 1–3 with fractional parts. In ex. 3 have pupils indicate that they change 4 to 3, then regroup the 1 as $\frac{4}{4}$, since $\frac{3}{4}$ must be subtracted.

Present problems dealing with shopping, involving mixed operations.

A Shopping Trip

1. Mrs. White took Susan to the city to do some shopping. Mrs. White's bus ticket cost \$.85 and Susan's ticket cost \$.43. How much did both tickets cost? \$ 1.28

2. Susan's father gave her \$3.00 to spend. She wanted a sweater that cost \$2.25 and a belt that cost \$.95. How much money did Susan's mother need to give her so she could buy both the sweater and the belt? \$ .20

3. Susan and her mother ate their lunch in a big store. Each one ordered a special lunch that cost \$.75. How much did the two lunches cost? \$ 1.50

4. Mrs. White bought a hat for \$6.95. How much change did she get from a ten-dollar bill? \$ 3.05

5. Mrs. White bought Susan a dress for \$7.47. The dress had been marked down from \$9.95. How much did Mrs. White save on the dress? \$ 2.48

6. In a window Susan saw a small radio for \$15.95. She had \$11.00 in her bank at home. If she could save \$.45 a week, in how many weeks would she have the rest of the money to buy the radio? 11

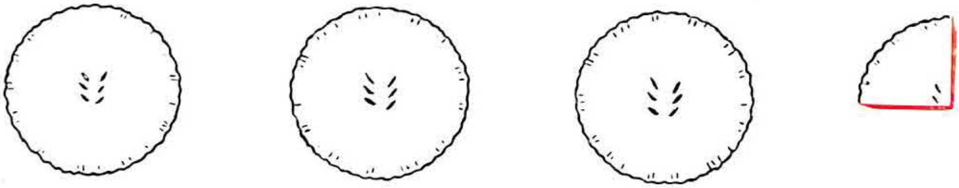
7. Susan and her mother reached home at 5:25 P.M. They had left home at 7:50 A.M. How long were they gone? 9 hr. 35 min.

Teach subtraction of fractions with like denominators when fraction in minuend is smaller than fraction in subtrahend

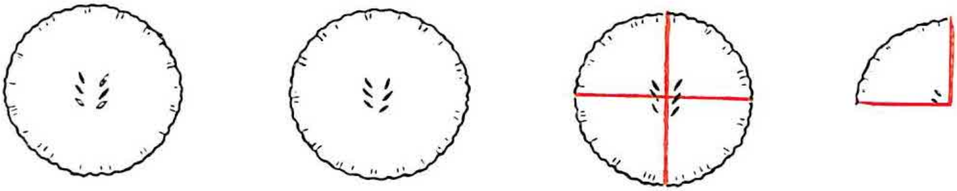
Changing Mixed Numbers

(pages 206-207).

1. Here are $3\frac{1}{4}$ pies. Suppose you want to give each one of 3 people $\frac{1}{4}$ of a pie. Then you will have to cut one of the



whole pies into fourths, as shown below. You see that this



picture shows that $3\frac{1}{4}$ pies $= 2\frac{5}{4}$ pies.

2. Draw a picture to show that $2\frac{3}{8}$ pies $= 1\frac{11}{8}$ pies.

3. **Problem** Mrs. Hunt had $3\frac{3}{8}$ yd. of cloth. She used $1\frac{7}{8}$ yd. of it. How many yards of cloth did she have left? $1\frac{1}{2}$

Explanation Since you cannot subtract $\frac{7}{8}$ from $\frac{3}{8}$, change $3\frac{3}{8}$ to $2\frac{11}{8}$. You can then subtract $\frac{7}{8}$ from $\frac{11}{8}$ and 1 from 2. The answer is $1\frac{4}{8}$ or $1\frac{1}{2}$. Mrs. Hunt had $1\frac{1}{2}$ yd. of cloth left.

$$\begin{array}{rcr} 3\frac{3}{8} & = & 2\frac{11}{8} \\ \underline{1\frac{7}{8}} & = & \underline{1\frac{7}{8}} \\ & & 1\frac{4}{8} = 1\frac{1}{2} \end{array}$$

Emphasize reason for exchange of whole for particular unit, depending on fraction being subtracted.

Subtract. Check by going over your work:

4.	$2\frac{1}{3}$	$5\frac{1}{6}$	$6\frac{3}{8}$	$4\frac{3}{5}$	$9\frac{4}{10}$	$3\frac{1}{12}$	$7\frac{5}{16}$
	$\frac{2}{3}$	$\frac{5}{6}$	$\frac{5}{8}$	$1\frac{4}{5}$	$6\frac{9}{10}$	$1\frac{5}{12}$	$5\frac{7}{16}$
	$1\frac{2}{3}$	$4\frac{1}{3}$	$5\frac{3}{4}$	$2\frac{4}{5}$	$2\frac{1}{2}$	$1\frac{2}{3}$	$1\frac{7}{8}$
5.	$4\frac{1}{8}$	$7\frac{1}{8}$	$3\frac{2}{5}$	$6\frac{3}{8}$	$4\frac{9}{12}$	$8\frac{3}{10}$	$5\frac{1}{16}$
	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{3}{5}$	$5\frac{6}{8}$	$2\frac{11}{12}$	$1\frac{5}{10}$	$4\frac{7}{16}$
	$3\frac{1}{2}$	$6\frac{1}{4}$	$2\frac{4}{5}$	$\frac{5}{8}$	$1\frac{5}{6}$	$6\frac{4}{5}$	$\frac{5}{8}$

More Practice. See ㉟ on page 322.

Explain ex. 3 with fractional cutouts. Let pupils use own fractional parts to see that $\frac{7}{8}$ cannot be subtracted from $\frac{3}{8}$, and how exchange is made. Be sure pupils do work in ex. 4-5 as shown in ex. 3.

Problems and Practice

1. Mother needed $2\frac{1}{3}$ cups of nuts for cookies and cake. When she had shelled the nuts she had, there were only $1\frac{2}{3}$ cups. How many more cups of nuts did she need? $\frac{2}{3}$

2. At the store Ann saw 2 packages of American cheese. One weighed $2\frac{3}{16}$ lb. and the other weighed $1\frac{13}{16}$ lb. What was the difference in their weights? $\frac{3}{8}$ lb.

3. After school on Friday Andy worked $1\frac{3}{4}$ hr. On Saturday he worked $5\frac{1}{4}$ hr. How many more hours did he work on Saturday than on Friday? $3\frac{1}{2}$

4. In a store Betty saw one package of cookies that weighed $1\frac{3}{16}$ lb. There was another package that weighed $2\frac{1}{16}$ lb. How much more did one package weigh than the other? $\frac{7}{8}$ lb.

5. Jim wanted to ride his bicycle $10\frac{3}{10}$ mi. to Hatfield. He rested where the sign said it was $4\frac{7}{10}$ mi. to Hatfield. How many miles had he already ridden? $5\frac{3}{5}$

6. Tom had a board 6 ft. long. He cut off a piece $4\frac{1}{2}$ ft. long. How long was the piece that was left? $1\frac{1}{2}$ ft.

Subtract. Check by going over your work:

7.	$2\frac{1}{8}$ $\frac{5}{8}$ $1\frac{1}{2}$	$4\frac{2}{5}$ $\frac{3}{5}$ $3\frac{4}{5}$	$9\frac{1}{10}$ $7\frac{7}{10}$ $1\frac{2}{5}$	$7\frac{3}{16}$ $4\frac{9}{16}$ $2\frac{5}{8}$	$8\frac{7}{12}$ $4\frac{11}{12}$ $3\frac{2}{3}$	$2\frac{5}{16}$ $1\frac{11}{16}$ $\frac{5}{8}$	$9\frac{1}{16}$ $6\frac{5}{16}$ $2\frac{3}{4}$
8.	$3\frac{1}{4}$ $\frac{2}{4}$ $2\frac{3}{4}$	$8\frac{1}{5}$ $\frac{4}{5}$ $7\frac{2}{5}$	$8\frac{1}{16}$ $3\frac{9}{16}$ $4\frac{1}{2}$	$4\frac{1}{10}$ $2\frac{9}{10}$ $1\frac{1}{5}$	$7\frac{3}{16}$ $2\frac{5}{16}$ $4\frac{7}{8}$	$5\frac{1}{10}$ $4\frac{3}{10}$ $\frac{4}{5}$	$6\frac{13}{16}$ $1\frac{15}{16}$ $4\frac{7}{8}$
9.	$1\frac{1}{8}$ $\frac{3}{8}$ $\frac{3}{4}$	$6\frac{1}{6}$ $\frac{4}{6}$ $5\frac{1}{2}$	$6\frac{11}{16}$ $4\frac{13}{16}$ $1\frac{7}{8}$	$8\frac{1}{12}$ $6\frac{11}{12}$ $1\frac{1}{6}$	$6\frac{7}{16}$ $2\frac{13}{16}$ $3\frac{5}{8}$	$3\frac{3}{16}$ $2\frac{15}{16}$ $\frac{1}{4}$	$9\frac{3}{10}$ $4\frac{9}{10}$ $4\frac{2}{5}$
10.	$5\frac{2}{5}$ $\frac{4}{5}$ $4\frac{3}{5}$	$7\frac{3}{8}$ $\frac{5}{8}$ $6\frac{3}{4}$	$9\frac{1}{16}$ $5\frac{15}{16}$ $3\frac{1}{8}$	$6\frac{3}{10}$ $3\frac{7}{10}$ $2\frac{3}{5}$	$5\frac{9}{16}$ $\frac{13}{16}$ $4\frac{3}{4}$	$8\frac{1}{16}$ $1\frac{11}{16}$ $6\frac{3}{8}$	$7\frac{5}{16}$ $3\frac{9}{16}$ $3\frac{3}{4}$

More Practice. See ㊱ on page 322.

Do ex. 1-6 with pupils, letting different ones explain exchange and reason for unit chosen. Have pupils do ex. 7-10 independently. Insist that equal signs be used, and that whole numbers and fractions appear in both columns.

Adding Three Fractions

1. **Problem** For sandwiches Susan bought $\frac{1}{4}$ lb. of butter, $\frac{7}{16}$ lb. of cheese, and $\frac{1}{2}$ lb. of meat. How much did these things weigh all together? $1\frac{3}{16}$ lb.

Explanation You can use 16 for a common denominator because all the denominators of these fractions are factors of 16. Change $\frac{1}{4}$ to $\frac{4}{16}$ and $\frac{1}{2}$ to $\frac{8}{16}$. Then add as shown at the right. The sum is $\frac{19}{16}$ or $1\frac{3}{16}$. The things weighed $1\frac{3}{16}$ lb.

$$\begin{array}{rcl} \frac{1}{4} & = & \frac{4}{16} \\ \frac{7}{16} & = & \frac{7}{16} \\ \frac{1}{2} & = & \underline{\frac{8}{16}} \\ & & \frac{19}{16} = 1\frac{3}{16} \end{array}$$

2. **Problem** Add these numbers: $4\frac{2}{5}$, $3\frac{1}{2}$, $5\frac{7}{10}$. $13\frac{3}{5}$

Explanation These fractions can all be changed to tenths. Add the fractions; the sum is $\frac{16}{10}$. Then add the whole numbers. Their sum is 12. $12\frac{16}{10}$ equals $13\frac{6}{10}$. Change the fraction to lowest terms. The answer is $13\frac{3}{5}$.

$$\begin{array}{rcl} 4\frac{2}{5} & = & 4\frac{4}{10} \\ 3\frac{1}{2} & = & 3\frac{5}{10} \\ 5\frac{7}{10} & = & \underline{5\frac{7}{10}} \\ & & 12\frac{16}{10} = 13\frac{6}{10} = 13\frac{3}{5} \end{array}$$

3. Mrs. Hill needs $1\frac{1}{4}$ yd. of cloth for a skirt for Jean, $\frac{7}{8}$ yd. for a jacket, and $\frac{1}{4}$ yd. for a cap. How many yards of material does she need all together? $2\frac{3}{8}$

4. Mrs. Hill saw a piece of material that was $2\frac{1}{2}$ yd. long. Was it long enough to make Jean's skirt, jacket, and cap? Yes How much too long or too short was it? $\frac{1}{8}$ yd. long

Add these numbers. Check by going over your work:

5.

$\frac{1}{6}$	$\frac{1}{8}$	$1\frac{7}{8}$	$6\frac{2}{5}$	$2\frac{3}{16}$	$1\frac{7}{12}$	$3\frac{5}{16}$	$5\frac{3}{10}$
$\frac{3}{6}$	$\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{1}{5}$	$1\frac{9}{16}$	$3\frac{11}{12}$	$3\frac{7}{16}$	$2\frac{9}{10}$
$\frac{1}{6}$	$\frac{3}{8}$	$4\frac{1}{8}$	$2\frac{4}{5}$	$4\frac{5}{16}$	$1\frac{5}{12}$	$2\frac{9}{16}$	$4\frac{1}{10}$
$\frac{5}{6}$	$\frac{7}{8}$	$9\frac{3}{8}$	$12\frac{2}{5}$	$8\frac{1}{16}$	$6\frac{11}{12}$	$9\frac{5}{16}$	$12\frac{3}{10}$

6.

$\frac{3}{4}$	$\frac{3}{8}$	$2\frac{1}{2}$	$1\frac{5}{6}$	$2\frac{7}{12}$	$6\frac{2}{5}$	$\frac{5}{6}$	$4\frac{1}{4}$
$\frac{1}{2}$	$\frac{1}{4}$	$6\frac{3}{8}$	$1\frac{1}{2}$	$2\frac{1}{6}$	$\frac{9}{10}$	$2\frac{1}{3}$	$2\frac{11}{16}$
$\frac{3}{4}$	$\frac{7}{8}$	$3\frac{7}{8}$	$1\frac{5}{6}$	$3\frac{11}{12}$	$1\frac{4}{5}$	$1\frac{5}{12}$	$3\frac{1}{4}$
2	$1\frac{1}{2}$	$12\frac{3}{4}$	$5\frac{1}{6}$	$8\frac{2}{3}$	$9\frac{1}{10}$	$4\frac{7}{12}$	$10\frac{3}{16}$

More Practice. See ㊲ on page 322.

Follow development as given on page, doing ex. 1–4 with pupils. In ex. 5–6 be sure pupils show work as in ex. 1–2. Emphasize that improper fractions must be changed to mixed numbers and fractions must be changed to lowest terms.

Problems with Extra Numbers

In each problem you will find one or more numbers that are not needed in finding the answer. Tell which numbers are not needed and then work the problem:

1. In Mary's room 33 children sold 216 candy bars in 5 school days. That was an average of about how many a day? "33" not needed; 43 candy bars

2. Mrs. Wood bought 3 pieces of cloth with these lengths: $1\frac{3}{4}$ yd., $2\frac{1}{2}$ yd., $4\frac{1}{4}$ yd. The pieces cost $1.40, $2.00, and $3.40. How much in all did Mrs. Wood pay for the cloth? "3," "$1\frac{3}{4}$," "$2\frac{1}{2}$," and "$4\frac{1}{4}$" not needed; $6.80

3. Jim bought 8 apples. They weighed 3 lb. and cost $.15 a pound. How much did Jim pay for the apples? "8" not needed; $.45

4. Sally is 53 in. tall and weighs 63 lb. Jack is $57\frac{1}{2}$ in. tall and weighs 72 lb. How much taller than Sally is Jack? "63" and "72" not needed; $4\frac{1}{2}$ in.

5. At the filling station Mr. King paid $2.90 for 10 gal. of gasoline and $2.15 for 5 qt. of oil. How much in all did Mr. King pay for gas and oil? "10" and "5" not needed; $5.05

Mixed Practice

6. Bill is counting the coins he has saved. There are 5 half dollars, 11 quarters, 19 dimes, 26 nickels, and 14 pennies. How much money is that all together? $8.59

7. Find the sum of $6\frac{2}{3}$, $4\frac{1}{2}$, and $3\frac{7}{12}$. $14\frac{3}{4}$

8. Find the difference between $9\frac{7}{8}$ and $4\frac{1}{4}$. $5\frac{5}{8}$

9. Change to mixed numbers: $\frac{7}{6}$, $1\frac{1}{6}$ $\frac{15}{4}$, $3\frac{3}{4}$ $\frac{14}{3}$, $4\frac{2}{3}$ $\frac{16}{6}$, $2\frac{2}{3}$ $\frac{20}{8}$, $2\frac{1}{2}$ $\frac{24}{5}$. $4\frac{4}{5}$

10. Change to lowest terms: $\frac{6}{8}$, $\frac{3}{4}$ $\frac{3}{6}$, $\frac{1}{2}$ $\frac{4}{10}$, $\frac{2}{5}$ $\frac{10}{12}$, $\frac{5}{6}$ $\frac{12}{18}$, $\frac{2}{3}$ $\frac{15}{20}$. $\frac{3}{4}$

11. Write in Roman numerals: 46, XLVI 83, LXXXIII 95, XCV 110, CX 250, CCL 474, CDLXXIV 829, DCCCXXIX 1331, MCCCXXXI 1776, MDCCLXXVI 1958. MCMLVIII

12. Find the average of 1734, 1806, 2117, 2006, 1967. 1926

13. How much will $\frac{1}{2}$ yd. of ribbon cost at $.88 a yard? $.44

14. Write three fractions that are each equal to $\frac{1}{2}$.

Let pupils do these examples independently. Then in discussing ex. 1-5 have pupils tell why facts selected are unnecessary. Use ex. 6-14 as spot-check for class or individual weaknesses.

Review basic skills in multiplication, fractions, and division.

Problems and Practice

Can you find any mistakes in ex. 1 and 2? If you find that the work is wrong, copy the example and work it correctly: *

1. $\begin{array}{r} 246 \\ 104 \\ \hline 984 \\ 246 \\ \hline 3444 \end{array}$ $\qquad$ $\begin{array}{r} 560 \\ 382 \\ \hline 1120 \\ 4480 \\ 1680 \\ \hline 62720 \end{array}$ $\qquad$ $\begin{array}{r} 316 \\ 230 \\ \hline 9480 \\ 632 \\ \hline 15800 \end{array}$ $\qquad$ $\begin{array}{r} 728 \\ 209 \\ \hline 6552 \\ 1456 \\ \hline 152252 \end{array}$

2. $\begin{array}{r} 59 \\ 35\overline{)17815} \\ 175 \\ \hline 315 \\ 315 \\ \hline \end{array}$ $\qquad$ $\begin{array}{r} 84 \\ 19\overline{)15960} \\ 152 \\ \hline 76 \\ 76 \\ \hline \end{array}$ $\qquad$ $\begin{array}{r} 586 \\ 43\overline{)24210} \\ 205 \\ \hline 371 \\ 344 \\ \hline 270 \\ 268 \\ \hline 2 \end{array}$ $\qquad$ $\begin{array}{r} 94 \\ 58\overline{)54527} \\ 522 \\ \hline 232 \\ 232 \\ \hline 7 \end{array}$

*Ex. 1-2 all contain errors; see G-74 for corrected examples.

3. Ann went to the store to buy a roast of meat weighing about 6 lb. The man had one weighing $6\frac{3}{8}$ lb. and one weighing $5\frac{11}{16}$ lb. Ann bought the smaller roast. How much less than 6 lb. did it weigh? $\frac{5}{16}$ lb.

4. Mr. King bought a 10-trip ticket to the city for \$4.76. If he should buy a ticket for each trip, it would cost him \$.56. How much did he save by buying the 10-trip ticket? \$.84

5. Dick's goat gave $2\frac{3}{4}$ qt. of milk on Friday, $2\frac{1}{2}$ qt. on Saturday, and $2\frac{7}{8}$ qt. on Sunday. How many quarts did Dick get in the three days? $8\frac{1}{8}$

Divide and check:

6. $\begin{array}{r} 347 \\ 68\overline{)23596} \end{array}$ $\qquad$ $\begin{array}{r} 829 \text{ R5} \\ 36\overline{)29849} \end{array}$ $\qquad$ $\begin{array}{r} 907 \\ 42\overline{)38094} \end{array}$ $\qquad$ $\begin{array}{r} 486 \text{ R8} \\ 57\overline{)27710} \end{array}$

7. $\begin{array}{r} 943 \\ 29\overline{)27347} \end{array}$ $\qquad$ $\begin{array}{r} 805 \\ 75\overline{)60375} \end{array}$ $\qquad$ $\begin{array}{r} 676 \\ 50\overline{)33800} \end{array}$ $\qquad$ $\begin{array}{r} 587 \\ 83\overline{)48721} \end{array}$

8. $\begin{array}{r} 690 \text{ R7} \\ 34\overline{)23467} \end{array}$ $\qquad$ $\begin{array}{r} 768 \\ 91\overline{)69888} \end{array}$ $\qquad$ $\begin{array}{r} 856 \\ 16\overline{)13696} \end{array}$ $\qquad$ $\begin{array}{r} 989 \text{ R4} \\ 64\overline{)63300} \end{array}$

Let different pupils explain corrected work in ex. 1-2 after telling what error or errors they found. Let partners check each others work in ex. 6-8 and point out specific errors to owner of paper.

Changing Fractions in Quotients

1. **Problem** Fred gathered 90 eggs last night. How many dozens of eggs is that? $7\frac{1}{2}$

Explanation You see that 90 ÷ 12 = 7 with a remainder of 6. This means there are 7 doz. and 6 eggs more. 6 eggs are $\frac{6}{12}$ or $\frac{1}{2}$ doz., so 90 eggs are $7\frac{1}{2}$ doz.

$$\begin{array}{r} 7\frac{1}{2} \\ 12\overline{)90} \\ \underline{84} \\ 6 \end{array}$$

2. **Problem** Divide 765 by 36. $21\frac{1}{4}$

Explanation Study the work at the right. In this example, by what number were both terms of $\frac{9}{36}$ divided to change $\frac{9}{36}$ to $\frac{3}{12}$? How was $\frac{3}{12}$ changed to $\frac{1}{4}$? If both terms of $\frac{9}{36}$ are divided by 9, the fraction can be changed to lowest terms in one step.

$$\begin{array}{r} 21\frac{1}{4} \\ 36\overline{)765} \\ \underline{72} \\ 45 \\ \underline{36} \\ 9 \end{array}$$

$\frac{9}{36} = \frac{3}{12} = \frac{1}{4}$

Divide. Change fractions to lowest terms:

3. $18\overline{)780}$ $43\frac{1}{3}$ $55\overline{)2550}$ $46\frac{4}{11}$ $29\overline{)4720}$ $162\frac{22}{29}$ $86\overline{)1998}$ $23\frac{10}{43}$ $24\overline{)3480}$ 145

4. $23\overline{)328}$ $14\frac{6}{23}$ $39\overline{)2971}$ $76\frac{7}{39}$ $81\overline{)3996}$ $49\frac{1}{3}$ $42\overline{)3156}$ $75\frac{1}{7}$ $35\overline{)5586}$ $159\frac{3}{5}$

5. $14\overline{)889}$ $63\frac{1}{2}$ $56\overline{)1204}$ $21\frac{1}{2}$ $25\overline{)1610}$ $64\frac{2}{5}$ $45\overline{)4240}$ $94\frac{2}{9}$ $36\overline{)2748}$ $76\frac{1}{3}$

6. A train traveled 508 mi. in 8 hr. Find the average speed of the train in miles per hour. $63\frac{1}{2}$

7. The girls in Betty's class will make arm bands for all the children who march in a big parade. They need 1350 in. of ribbon all together. How many yards of ribbon do the girls need? $37\frac{1}{2}$

8. Last week Mr. Weed gathered 7647 eggs from his hens. How many dozen eggs did he get last week? $637\frac{1}{4}$

9. Divide each number by 24: 56 $2\frac{1}{3}$ 164 $6\frac{5}{6}$ 1677 $69\frac{7}{8}$ 3303 $137\frac{5}{8}$

10. Divide each number by 27: 84 $3\frac{1}{9}$ 153 $5\frac{2}{3}$ 1845 $68\frac{1}{3}$ 6390 $236\frac{2}{3}$

More Practice. See ㊳ on page 323.

Remind pupils that in changing fractions both terms must be divided by same number and that fraction is in lowest terms when there is no number, except 1, by which both terms can be divided.

Present problems dealing with travel in colonial days.

Travel by Stagecoach

Before the year 1750 few people had the time or the money to go far from home. At first the few travelers there were rode on horseback. Later on people traveled by stagecoach, but this was a hard trip and often dangerous because of the deep holes and mud in the roads.

1. In 1756 the first stagecoach line carried passengers and packages between New York and Philadelphia. It took 3 da. to make this trip of 90 mi. What was the average number of miles traveled in a day? 30
2. By 1771 the roads between New York and Philadelphia were not so rough and the coaches were better. It was possible to make the trip in half the former time. How many days did it now take for the trip? $1\frac{1}{2}$ See ex. 1.
3. Passengers making the trip between Philadelphia and Baltimore in 1788 could choose to go either by sailboat or by stagecoach. For the last 37 mi. of the journey, passengers

Correlate these problems with map reading and encourage comparisons between travel in 1750 and today.

were taken free on the stagecoach in order to keep the sailboat from getting all the trade. The stagecoach company charged as follows:

Philadelphia to Chester	15 mi.	$1.25
Chester to Wilmington	13 mi.	1.24
Wilmington to Elk	22 mi.	1.89
Elk to Susquehanna	16 mi.	1.87
Susquehanna to Baltimore	37 mi.	free

How many miles was it from Philadelphia to Baltimore? 103
How much did it cost for the through trip? $ 6.25

4. In 1802 one could go by stagecoach from Boston to Savannah, Georgia. How many days in all did it take to make this trip? $22\frac{1}{2}$

Boston to New York	4 days	$10.00
New York to Philadelphia	$1\frac{1}{2}$ days	5.00
Philadelphia to Charleston	15 days	50.00
Charleston to Savannah	2 days	5.00

How much did it cost for the trip from Boston to Savannah? $ 70.00

Urge pupils to investigate and compare costs of travel (bus, train, and so on) today with those shown in ex. 3–4.

Extend work in subtraction of fractions, when regrouping is necessary, to unlike but related fractions (pages 214-216).

Which Girl Wins?

1. **Problem** Patty swam across the pool in $46\frac{1}{2}$ sec. It took Ann $50\frac{3}{10}$ sec. How much less time did it take Patty to swim across the pool than it took Ann? $3\frac{4}{5}$ sec.

Explanation In A you see that you must change $46\frac{1}{2}$ to $46\frac{5}{10}$ so that both fractions have the same denominator. But you cannot subtract $\frac{5}{10}$ from $\frac{3}{10}$, so you must change $50\frac{3}{10}$ to $49\frac{13}{10}$, as shown in B. Then you can subtract $\frac{5}{10}$ from $\frac{13}{10}$, which leaves $\frac{8}{10}$. You also subtract 46 from 49, which leaves 3. The answer is $3\frac{8}{10}$ or $3\frac{4}{5}$. Patty's time was $3\frac{4}{5}$ sec. less than Ann's time.

$$\begin{array}{rcr} \text{A} & & \text{B} \\ 50\frac{3}{10} & = & 49\frac{13}{10} \\ \underline{46\frac{1}{2}} & = & \underline{46\frac{5}{10}} \\ & & 3\frac{8}{10} = 3\frac{4}{5} \end{array}$$

2. How much less than $5\frac{1}{4}$ yd. is $2\frac{1}{2}$ yd.? $2\frac{3}{4}$ yd.

Subtract. Check your work by going over it:

$$\begin{array}{lrrrrrrr} \textbf{3.} & 9\frac{3}{8} & 6\frac{1}{6} & 9\frac{3}{16} & 7\frac{1}{10} & 4\frac{1}{12} & 8\frac{1}{16} & 5\frac{7}{12} \\ & 7\frac{3}{4} & 2\frac{2}{3} & 4\frac{1}{4} & 4\frac{1}{5} & 3\frac{3}{4} & 7\frac{5}{8} & 1\frac{3}{4} \\ \hline & 1\frac{5}{8} & 3\frac{1}{2} & 4\frac{15}{16} & 2\frac{9}{10} & \frac{1}{3} & \frac{7}{16} & 3\frac{5}{6} \end{array}$$

$$\begin{array}{lrrrrrrr} \textbf{4.} & 4\frac{1}{4} & 7\frac{3}{8} & 3\frac{5}{16} & 4\frac{5}{12} & 6\frac{11}{16} & 9\frac{3}{10} & 7\frac{5}{12} \\ & 1\frac{1}{2} & 6\frac{1}{2} & 2\frac{3}{8} & 2\frac{5}{6} & 5\frac{7}{8} & 8\frac{3}{5} & 3\frac{2}{3} \\ \hline & 2\frac{3}{4} & \frac{7}{8} & \frac{15}{16} & 1\frac{7}{12} & \frac{13}{16} & \frac{7}{10} & 3\frac{3}{4} \end{array}$$

$$\begin{array}{lrrrrrrr} \textbf{5.} & 7\frac{1}{6} & 5\frac{1}{8} & 9\frac{1}{16} & 8\frac{7}{10} & 3\frac{1}{12} & 6\frac{1}{10} & 9\frac{1}{12} \\ & 1\frac{1}{3} & 3\frac{1}{2} & 5\frac{7}{8} & 6\frac{4}{5} & 1\frac{1}{4} & 3\frac{4}{5} & 3\frac{5}{6} \\ \hline & 5\frac{5}{6} & 1\frac{5}{8} & 3\frac{3}{16} & 1\frac{9}{10} & 1\frac{5}{6} & 2\frac{3}{10} & 5\frac{1}{4} \end{array}$$

More Practice. See ㊴ on page 323.

In ex. 1 show intermediate step ($50\frac{3}{10}$ and $46\frac{5}{10}$) between writing example and showing regrouping procedure. Have pupils do same in ex. 3-5. Remind pupils to change fractions to lowest terms.

More Subtraction

1. Problem Subtract $5\frac{7}{12}$ from $8\frac{1}{4}$. $2\frac{2}{3}$

Explanation In A you see that you cannot subtract **twelfths** from **fourths**, so you change the fourths to twelfths, as shown in B. But you cannot subtract $\frac{7}{12}$ from $\frac{3}{12}$, so you change $8\frac{3}{12}$ to $7\frac{15}{12}$, as shown in C. You can then subtract $\frac{7}{12}$ from $\frac{15}{12}$, which gives $\frac{8}{12}$ or $\frac{2}{3}$. Also subtract 5 from 7, which gives 2. The difference is $2\frac{2}{3}$.

A		B		C
$8\frac{1}{4}$	=	$8\frac{3}{12}$	=	$7\frac{15}{12}$
$\underline{5\frac{7}{12}}$	=	$\underline{5\frac{7}{12}}$	=	$\underline{5\frac{7}{12}}$
				$2\frac{8}{12} = 2\frac{2}{3}$

$4\frac{3}{4} = 4\frac{6}{8} = 3\frac{14}{8}$ $3\frac{1}{2} = 3\frac{3}{6} = 2\frac{9}{6}$

2. Show how to change $4\frac{3}{4}$ to $3\frac{14}{8}$; to change $3\frac{1}{2}$ to $2\frac{9}{6}$.

Provide more exercises like ex. 3-5 for pupils having difficulty in changing fractions.

Tell what numbers to put in the numerators:

3. $2\frac{1}{2} = 2\frac{?}{6}\,3 = 1\frac{?}{6}\,9$ $9\frac{1}{6} = 9\frac{?}{12}\,2 = 8\frac{?}{12}\,14$ $6\frac{3}{4} = 6\frac{?}{16}\,12 = 5\frac{?}{16}\,28$

4. $4\frac{3}{4} = 4\frac{?}{8}\,6 = 3\frac{?}{8}\,14$ $4\frac{1}{2} = 4\frac{?}{10}\,5 = 3\frac{?}{10}\,15$ $5\frac{2}{5} = 5\frac{?}{10}\,4 = 4\frac{?}{10}\,14$

5. $8\frac{1}{3} = 8\frac{?}{6}\,2 = 7\frac{?}{6}\,8$ $2\frac{3}{8} = 2\frac{?}{16}\,6 = 1\frac{?}{16}\,22$ $7\frac{1}{2} = 7\frac{?}{12}\,6 = 6\frac{?}{12}\,18$

Subtract. Check your work by going over it:

6.	$\begin{array}{r} 7\frac{1}{4} \\ \underline{5\frac{7}{8}} \\ 1\frac{3}{8} \end{array}$	$\begin{array}{r} 9\frac{2}{5} \\ \underline{2\frac{7}{10}} \\ 6\frac{7}{10} \end{array}$	$\begin{array}{r} 6\frac{1}{8} \\ \underline{4\frac{3}{16}} \\ 1\frac{15}{16} \end{array}$	$\begin{array}{r} 5\frac{1}{4} \\ \underline{3\frac{15}{16}} \\ 1\frac{5}{16} \end{array}$	$\begin{array}{r} 9\frac{1}{4} \\ \underline{6\frac{5}{12}} \\ 2\frac{5}{6} \end{array}$	$\begin{array}{r} 6\frac{1}{6} \\ \underline{2\frac{7}{12}} \\ 3\frac{7}{12} \end{array}$	$\begin{array}{r} 8\frac{3}{5} \\ \underline{4\frac{7}{10}} \\ 3\frac{9}{10} \end{array}$
7.	$\begin{array}{r} 4\frac{2}{3} \\ \underline{3\frac{5}{6}} \\ \frac{5}{6} \end{array}$	$\begin{array}{r} 3\frac{5}{8} \\ \underline{1\frac{11}{16}} \\ 1\frac{15}{16} \end{array}$	$\begin{array}{r} 7\frac{1}{5} \\ \underline{2\frac{9}{10}} \\ 4\frac{3}{10} \end{array}$	$\begin{array}{r} 8\frac{3}{8} \\ \underline{7\frac{13}{16}} \\ \frac{9}{16} \end{array}$	$\begin{array}{r} 5\frac{1}{6} \\ \underline{1\frac{11}{12}} \\ 3\frac{1}{4} \end{array}$	$\begin{array}{r} 9\frac{1}{4} \\ \underline{3\frac{11}{16}} \\ 5\frac{9}{16} \end{array}$	$\begin{array}{r} 7\frac{2}{3} \\ \underline{6\frac{11}{12}} \\ \frac{3}{4} \end{array}$
8.	$\begin{array}{r} 9\frac{1}{2} \\ \underline{4\frac{7}{8}} \\ 4\frac{5}{8} \end{array}$	$\begin{array}{r} 8\frac{1}{4} \\ \underline{3\frac{7}{12}} \\ 4\frac{2}{3} \end{array}$	$\begin{array}{r} 4\frac{1}{8} \\ \underline{2\frac{15}{16}} \\ 1\frac{3}{16} \end{array}$	$\begin{array}{r} 6\frac{2}{5} \\ \underline{1\frac{9}{10}} \\ 4\frac{1}{2} \end{array}$	$\begin{array}{r} 5\frac{1}{8} \\ \underline{\frac{11}{16}} \\ 4\frac{7}{16} \end{array}$	$\begin{array}{r} 6\frac{1}{5} \\ \underline{5\frac{3}{10}} \\ \frac{9}{10} \end{array}$	$\begin{array}{r} 7\frac{1}{8} \\ \underline{3\frac{5}{16}} \\ 3\frac{13}{16} \end{array}$
9.	$\begin{array}{r} 6\frac{3}{4} \\ \underline{3\frac{7}{8}} \\ 2\frac{7}{8} \end{array}$	$\begin{array}{r} 5\frac{5}{8} \\ \underline{4\frac{13}{16}} \\ \frac{13}{16} \end{array}$	$\begin{array}{r} 8\frac{1}{4} \\ \underline{5\frac{11}{12}} \\ 2\frac{1}{3} \end{array}$	$\begin{array}{r} 7\frac{1}{4} \\ \underline{4\frac{13}{16}} \\ 2\frac{7}{16} \end{array}$	$\begin{array}{r} 9\frac{3}{8} \\ \underline{1\frac{7}{16}} \\ 7\frac{15}{16} \end{array}$	$\begin{array}{r} 5\frac{1}{6} \\ \underline{2\frac{5}{12}} \\ 2\frac{3}{4} \end{array}$	$\begin{array}{r} 9\frac{1}{8} \\ \underline{5\frac{7}{16}} \\ 3\frac{11}{16} \end{array}$

10. Subtract $2\frac{9}{16}$ from each: $5\frac{1}{4}$ $2\frac{11}{16}$ $8\frac{3}{8}$ $5\frac{13}{16}$ $4\frac{1}{2}$ $1\frac{15}{16}$ $7\frac{1}{8}$ $4\frac{9}{16}$ $3\frac{3}{8}$ $\frac{13}{16}$

More Practice. See ㊵ on page 323.

Stress fact that fractions must be changed to ones having common denominator "before" regrouping procedure is carried out.

Problems and Practice

1. Betty is $52\frac{3}{4}$ in. tall. Her brother is $55\frac{1}{2}$ in. tall. How much shorter is Betty than her brother? $2\frac{3}{4}$ in.

2. Mr. Wood drove to Fairfield in $3\frac{3}{4}$ hr. He took a longer road going back and needed $4\frac{1}{2}$ hr. to get home. How much longer did the ride home take Mr. Wood? $\frac{3}{4}$ hr.

3. Mrs. West wanted $1\frac{1}{2}$ lb. of sharp cheese. In the store she saw a package of cheese marked $1\frac{3}{4}$ lb. and another marked $1\frac{5}{16}$ lb. Which piece was nearer $1\frac{1}{2}$ lb.? How much more or less than $1\frac{1}{2}$ lb. was it? $\frac{3}{16}$ lb. less $1\frac{5}{16}$ lb.

4. Last Saturday the Cub Scouts walked $6\frac{5}{8}$ mi. They are planning to walk $7\frac{1}{2}$ mi. tomorrow. How much farther will they walk tomorrow than last Saturday? $\frac{7}{8}$ mi.

Subtract. Check your work by going over it:

5. $4\frac{1}{3} - 1\frac{11}{12}$ $2\frac{5}{12}$ $7\frac{2}{3} - 5\frac{5}{6}$ $1\frac{5}{6}$ $9\frac{3}{4} - 6\frac{13}{16}$ $2\frac{15}{16}$ $6\frac{3}{5} - 5\frac{9}{10}$ $\frac{7}{10}$

6. $8\frac{1}{4} - 6\frac{7}{16}$ $1\frac{13}{16}$ $9\frac{1}{2} - 3\frac{5}{8}$ $5\frac{7}{8}$ $3\frac{7}{8} - 1\frac{15}{16}$ $1\frac{15}{16}$ $8\frac{1}{2} - 2\frac{7}{12}$ $5\frac{11}{12}$

7. $6\frac{5}{6} - 4\frac{11}{12}$ $1\frac{11}{12}$ $2\frac{1}{6} - 1\frac{1}{2}$ $\frac{2}{3}$ $8\frac{3}{8} - 5\frac{11}{16}$ $2\frac{11}{16}$ $7\frac{1}{2} - 4\frac{11}{16}$ $2\frac{13}{16}$

8. $5\frac{1}{4} - 2\frac{5}{12}$ $2\frac{5}{6}$ $8\frac{1}{2} - 3\frac{5}{6}$ $4\frac{2}{3}$ $7\frac{2}{5} - 2\frac{9}{10}$ $4\frac{1}{2}$ $9\frac{2}{3} - 5\frac{11}{12}$ $3\frac{3}{4}$

9.	$9\frac{3}{4}$	$8\frac{1}{5}$	$5\frac{1}{12}$	$6\frac{1}{2}$	$8\frac{1}{4}$	$6\frac{1}{8}$	$7\frac{1}{2}$
	$6\frac{15}{16}$	$2\frac{7}{10}$	$3\frac{1}{3}$	$3\frac{11}{16}$	$4\frac{5}{8}$	$5\frac{9}{16}$	$2\frac{11}{12}$
	$2\frac{13}{16}$	$5\frac{1}{2}$	$1\frac{3}{4}$	$2\frac{13}{16}$	$3\frac{5}{8}$	$\frac{9}{16}$	$4\frac{7}{12}$
10.	$7\frac{3}{16}$	$3\frac{4}{5}$	$9\frac{1}{2}$	$5\frac{5}{8}$	$9\frac{1}{2}$	$8\frac{5}{16}$	$4\frac{1}{3}$
	$3\frac{3}{4}$	$2\frac{9}{10}$	$8\frac{9}{10}$	$1\frac{15}{16}$	$2\frac{3}{4}$	$6\frac{3}{4}$	$3\frac{7}{12}$
	$3\frac{7}{16}$	$\frac{9}{10}$	$\frac{3}{5}$	$3\frac{11}{16}$	$6\frac{3}{4}$	$1\frac{9}{16}$	$\frac{3}{4}$
11.	$8\frac{13}{16}$	$6\frac{3}{16}$	$3\frac{3}{8}$	$5\frac{1}{12}$	$4\frac{3}{8}$	$7\frac{1}{16}$	$9\frac{3}{5}$
	$3\frac{7}{8}$	$2\frac{5}{8}$	$1\frac{15}{16}$	$4\frac{2}{3}$	$1\frac{3}{4}$	$4\frac{1}{8}$	$5\frac{9}{10}$
	$4\frac{15}{16}$	$3\frac{9}{16}$	$1\frac{7}{16}$	$\frac{5}{12}$	$2\frac{5}{8}$	$2\frac{15}{16}$	$3\frac{7}{10}$
12.	$8\frac{3}{4}$	$9\frac{3}{10}$	$7\frac{3}{16}$	$4\frac{1}{2}$	$9\frac{5}{8}$	$6\frac{1}{16}$	$5\frac{1}{3}$
	$5\frac{11}{12}$	$4\frac{2}{5}$	$6\frac{3}{8}$	$2\frac{13}{16}$	$7\frac{3}{4}$	$4\frac{1}{2}$	$2\frac{5}{12}$
	$2\frac{5}{6}$	$4\frac{9}{10}$	$\frac{13}{16}$	$1\frac{11}{16}$	$1\frac{7}{8}$	$1\frac{9}{16}$	$2\frac{11}{12}$

Let pupils do this work independently. Group those who have difficulties for reteaching, stressing meanings.

Extend work in finding fractional parts to larger numbers (multiplication of whole number by fraction), pages 217-219.

Fractional Parts of Numbers

1. **Problem** Jack bought a radio for $\frac{3}{4}$ the price it had been marked. The marked price was $40. How much did Jack pay for the radio? $30

Explanation An easy way to find $\frac{3}{4}$ of 40 is to think like this:

$\frac{1}{4}$ of 40 = 10,
so $\frac{3}{4}$ of 40 = 3 × 10, or 30

Jack paid $30 for the radio.

2. When you find $\frac{3}{4}$ of 40, you are finding a **fractional part of a number.** In examples like $\frac{3}{4}$ of 40, you can do the work mentally because the numbers are not large.

3. **Problem** Suppose the marked price of the radio in ex. 1 had been $39.40 instead of $40. What would Jack have paid? $29.55

Explanation It is not easy to do this example mentally. You can do the work as shown at the right. First find $\frac{1}{4}$ of $39.40, which is $9.85. Then multiply $9.85 by 3. The product is $29.55. Jack would have paid $29.55 in this case.

$$\begin{array}{r} \$9.85 \\ 4\overline{)\$39.40} \\ 36 \\ \hline 3\,4 \\ 3\,2 \\ \hline 20 \\ 20 \\ \hline \end{array} \qquad \begin{array}{r} \$9.85 \\ 3 \\ \hline \$29.55 \end{array}$$

Find the answers. Check your work by going over it:

4. $\frac{5}{8}$ of 296 185 $\frac{2}{5}$ of 210 84 $\frac{5}{6}$ of 138 115 $\frac{3}{8}$ of $3.76 $1.41
5. $\frac{3}{5}$ of 185 111 $\frac{7}{8}$ of 120 105 $\frac{4}{5}$ of 225 180 $\frac{7}{8}$ of $4.72 $4.13
6. $\frac{3}{4}$ of 152 114 $\frac{5}{6}$ of 354 295 $\frac{3}{8}$ of 288 108 $\frac{3}{5}$ of $3.40 $2.04
7. $\frac{3}{8}$ of 232 87 $\frac{2}{5}$ of 140 56 $\frac{3}{4}$ of 336 252 $\frac{5}{8}$ of $6.88 $4.30
8. $\frac{4}{5}$ of 295 236 $\frac{5}{8}$ of 192 120 $\frac{2}{3}$ of 243 162 $\frac{5}{6}$ of $2.64 $2.20
9. Find $\frac{7}{8}$ of 368; of $3.52; of $2.48; of $1.92; of $3.36. $2.94
322 $3.08 $2.17 $1.68
10. Find $\frac{2}{3}$ of 117; of $2.22; of $1.65; of $2.55; of $1.98. $1.32
78 $1.48 $1.10 $1.70

More Practice. See ㊶ on page 324.

Before doing this work, have pupils turn back to page 61 for quick review of finding fractional part of smaller numbers. Then follow development as given above.

How Much Do They Cost?

1. After winter was past the Sports Store had a sale of sports goods. Patty bought a pair of skates on shoes for $\frac{3}{4}$ of the marked price of \$9.80. How much did Patty pay for the skates on shoes? \$ 7.35

2. Don bought a sled for $\frac{2}{3}$ of the marked price of \$8.85. How much did Don pay for the sled? \$ 5.90

3. Dick bought skis for $\frac{3}{4}$ of the marked price of \$10.00. How much did Dick spend for the skis? \$ 7.50

Stress. **4.** The example $\frac{3}{4}$ of \$10.00 is often written like this: $\frac{3}{4} \times \$10.00$. This is read "$\frac{3}{4}$ times \$10.00" and means $\frac{3}{4}$ of \$10.00. The sign × means "of" when the multiplier is a fraction. To find the product $\frac{3}{4} \times \$10.00$, the work is done in the way shown on page 217.

5. Ann bought a coat for $\frac{3}{4}$ of the marked price of \$25.00. How much did Ann pay for the coat? \$18.75 How much did she save? \$ 6.25

6. Andy paid $\frac{2}{3}$ of the cost of a 30-dollar radio. His father paid the rest. How much did Andy pay? \$ 20

Do problems with pupils, letting different ones read problem, another show it in numerical form on board, then have class solve problem. Be sure pupils understand that × sign means "of" when multiplier is a fraction.

Finding Fractional Parts

1. A fast train averages 60 mi. an hour. At that rate, how far will it go in 45 min. ($\frac{3}{4}$ hr.)? 45 mi. in 40 min.? 40 mi.

2. Susan can fill 24 small paper cups with a gallon of lemonade. If she makes $\frac{3}{4}$ gal. of lemonade, how many of these cups can she fill? 18

3. Mrs. Martin needs $\frac{3}{4}$ yd. of material for an apron. If she pays \$.68 a yard for material, how much will $\frac{3}{4}$ yd. cost? \$.51 If she pays \$.84 a yard, how much will $\frac{3}{4}$ yd. cost? \$.63

4. Find the cost of $\frac{3}{4}$ lb. of cheese at \$1.00 a pound. \$.75

5. Find the cost of $\frac{2}{3}$ yd. of cloth at \$7.50 a yard. \$ 5.00

6. Find the cost of $\frac{7}{8}$ yd. of ribbon at \$.88 a yard. \$.77

Have pupils explain meaning of times sign in ex. 7-11.

Multiply these numbers. Check by going over your work:

7. $\frac{3}{4} \times 44$ 33 $\frac{5}{6} \times 78$ 65 $\frac{2}{3} \times 75$ 50 $\frac{3}{5} \times \$1.20$ \$.72 $\frac{5}{6} \times \$3.00$ \$ 2.50
8. $\frac{5}{8} \times 48$ 30 $\frac{2}{5} \times 60$ 24 $\frac{3}{4} \times 76$ 57 $\frac{5}{6} \times \$2.04$ \$1.70 $\frac{5}{8} \times \$3.20$ \$ 2.00
9. $\frac{2}{3} \times 63$ 42 $\frac{3}{4} \times 64$ 48 $\frac{4}{5} \times 65$ 52 $\frac{3}{4} \times \$2.48$ \$1.86 $\frac{4}{5} \times \$2.00$ \$ 1.60
10. $\frac{5}{6} \times 42$ 35 $\frac{4}{5} \times 50$ 40 $\frac{5}{8} \times 96$ 60 $\frac{3}{8} \times \$2.24$ \$.84 $\frac{2}{3} \times \$3.48$ \$ 2.32
11. $\frac{3}{5} \times 80$ 48 $\frac{3}{4} \times 92$ 69 $\frac{2}{3} \times 87$ 58 $\frac{2}{5} \times \$1.75$ \$.70 $\frac{3}{4} \times \$3.60$ \$ 2.70

12. In each exercise above, the whole number can be divided exactly by the denominator of the fraction. To get each answer you first divide the whole number by the denominator and then multiply the result by the numerator. When the whole number is small, you can do the work mentally.

13. Multiply by $\frac{3}{4}$: 72 54 84 63 128 96 196 147 200 150 320 240
14. Multiply by $\frac{3}{8}$: 56 21 96 36 120 45 280 105 480 180 800 300
15. Multiply by $\frac{5}{6}$: 48 40 84 70 174 145 318 265 366 305 180 150
16. Multiply by $\frac{2}{3}$: 45 30 87 58 141 94 255 170 291 194 324 216

More Practice. See ㊷ on page 324.

Emphasize explanation of multiplication of whole number by fraction as given in ex. 12. Stress that after dividing we must multiply result by numerator.

Multiplying by a Mixed Number

1. Problem Sometimes Dick sells a chicken to a neighbor. Today he sold Mrs. Hunt a chicken weighing $4\frac{3}{8}$ lb. He asked \$.48 a pound. How much did the chicken cost? \$ 2.10

Explanation First find $\frac{3}{8}$ of 48, which is 18. Then multiply 48 by 4, which is 192. Be sure to place the 2 of 192 under the 4 by which you multiplied, as shown at the right. Then add 18 and 192 and put in the decimal point. Mrs. Hunt paid \$2.10.

$$\begin{array}{r} \$.48 \\ \underline{4\frac{3}{8}} \\ 18 \\ \underline{1\,92} \\ \$2.10 \end{array}$$

2. Dick's father sells turkeys. Yesterday he sold one that weighed $14\frac{3}{4}$ lb. He got \$.52 a pound for it. How much did he get for that turkey? \$ 7.67

3. Mary worked $3\frac{3}{4}$ hr. at \$.60 an hour. How much money did she get for that work? \$ 2.25

4. Mrs. Johnson bought a roast that weighed $7\frac{5}{8}$ lb. It cost \$.64 a pound. How much did the roast cost? \$ 4.88

5. Find the cost of $4\frac{1}{2}$ doz. eggs at \$.54 a dozen. \$ 2.43

Emphasize.

To multiply a whole number by a mixed number, multiply first by the fraction and then by the whole number and add the products.

Let different pupils write and explain their work in ex. 6–10 on blackboard.

Multiply. Check the work by going over it:

6. $5\frac{2}{3} \times 75$ 425 $3\frac{3}{8} \times 48$ 162 $11\frac{2}{5} \times 75$ 855 $8\frac{7}{8} \times \$3.28$ \$ 29.11
7. $6\frac{3}{4} \times 40$ 270 $1\frac{3}{5} \times 45$ 72 $15\frac{1}{6} \times 54$ 819 $5\frac{1}{3} \times \$1.77$ \$ 9.44
8. $2\frac{5}{8} \times 72$ 189 $4\frac{1}{3} \times 66$ 286 $12\frac{1}{5} \times 35$ 427 $1\frac{3}{4} \times \$1.60$ \$ 2.80
9. $7\frac{1}{2} \times 56$ 420 $2\frac{4}{5} \times 60$ 168 $16\frac{2}{3} \times 36$ 600 $7\frac{5}{6} \times \$2.40$ \$ 18.80
10. $3\frac{1}{8} \times 64$ 200 $9\frac{7}{8} \times 24$ 237 $25\frac{1}{2} \times 74$ 1887 $4\frac{3}{4} \times \$2.28$ \$ 10.83

More Practice. See ㊸ on page 324.

Discuss ex. 1 carefully with pupils, emphasizing that we multiply by fraction first, then whole number (be careful of product placement), and add both products.

Present timed tests on the four basic operations.

Testing Your Skill

Addition Test

Add. Write the answers on folded paper: Time: 4 min.

1.	3732 1698 5946 2964 3355 17,695	4785 2764 2545 5848 4058 20,000	4114 5576 2323 9878 1767 23,658	3273 5584 4136 2623 7298 22,914	3719 1089 9226 8115 9459 31,608

Subtraction Test

Subtract. Write the answers on folded paper: Time: 4 min.

2.	43356 33566 9790	17656 8598 9058	79713 43715 35,998	70000 34873 35,127
3.	30002 15624 14,378	78448 59535 18,913	63175 26347 36,828	69600 49996 19,604
4.	32458 26984 5474	40000 23105 16,895	79424 72694 6730	14824 8596 6228

Multiplication Test

Copy and multiply: Time: 5 min. after copying.*

5.	472 274 129,328	395 178 70,310	610 368 224,480	531 459 243,729	986 952 938,672	724 613 443,812

Division Test

Copy and divide: Time: 8 min. after copying.*

6.	312 R15 32)9999	520 43)22360	952 19)18088	863 37)31931
7.	403 16)6448	577 R45 54)31203	818 28)22904	608 R11 25)15211

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* In the multiplication and division tests, copy all the exercises on a sheet of paper before taking the test. In copying, spread the exercises over the sheet to allow space for the work. See page 328.

Note weaknesses and improvements on progress cards. Do not permit pupils to consider these tests as a "race," and sacrifice accuracy for speed. Give further practice to improve skill in computing.

See G-77 for correlation of examples with aims.

Chapter Review

1. Tell what number should be put in the numerators:

   $4\frac{2}{3} = 4\frac{?}{6} = 3\frac{?}{6}$ 4 10 $\qquad 3\frac{1}{4} = 3\frac{?}{16} = 2\frac{?}{16}$ 4 20 $\qquad 6\frac{3}{4} = 6\frac{?}{12} = 5\frac{?}{12}$ 9 21

2. What is the common denominator when you add $\frac{1}{2}$ and $\frac{1}{3}$? 6 when you add $\frac{2}{3}$ and $\frac{1}{4}$? 12

3. What is the common denominator when you subtract $\frac{1}{4}$ from $\frac{2}{3}$? 12 when you subtract $\frac{1}{2}$ from $\frac{4}{5}$? 10

4. By what number do you multiply both numerator and denominator of $\frac{3}{4}$ to change $\frac{3}{4}$ to $\frac{9}{12}$? 3 Does $\frac{3}{4} = \frac{9}{12}$? Yes

5. Find the difference between $6\frac{1}{3}$ and $4\frac{1}{2}$. $1\frac{5}{6}$

Subtract and check your work:

6.						
1	4	$6\frac{1}{4}$	$9\frac{3}{8}$	$8\frac{1}{6}$	$3\frac{1}{2}$	$7\frac{3}{4}$
$\frac{3}{8}$	$\frac{1}{6}$	$2\frac{3}{4}$	$5\frac{3}{4}$	$1\frac{7}{12}$	$\frac{2}{5}$	$4\frac{15}{16}$
$\frac{5}{8}$	$3\frac{5}{6}$	$3\frac{1}{2}$	$3\frac{5}{8}$	$6\frac{7}{12}$	$3\frac{1}{10}$	$2\frac{13}{16}$

Find the products:

7. $\frac{7}{8} \times 72$ 63 $\quad \frac{3}{4} \times 56$ 42 $\quad \frac{4}{5} \times 75$ 60 $\quad 3\frac{1}{3} \times 33$ 110 $\quad 7\frac{3}{8} \times \$1.20$ \$8.85

8. $\frac{2}{3} \times 63$ 42 $\quad \frac{5}{6} \times 42$ 35 $\quad \frac{5}{8} \times 96$ 60 $\quad 4\frac{1}{2} \times 38$ 171 $\quad 2\frac{4}{5} \times \$2.75$ \$7.70

9. Find the cost of $6\frac{3}{4}$ yd. of material at \$1.16 a yard. \$7.83

10. Make up a question for the following problem and then find the answer: Mr. King gave Bill \$.80 an hour for helping him. Bill worked $2\frac{3}{4}$ hr. on Friday and $6\frac{1}{2}$ hr. on Saturday.

Add and check your work:

11.						
$2\frac{1}{8}$	$3\frac{5}{6}$	$5\frac{1}{8}$	$4\frac{5}{12}$	$2\frac{3}{8}$	$1\frac{1}{2}$	$4\frac{7}{10}$
$\frac{7}{8}$	$2\frac{5}{6}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$4\frac{5}{16}$	$6\frac{1}{3}$	$3\frac{1}{2}$
$1\frac{3}{8}$	$4\frac{5}{6}$	$\frac{1}{2}$	$7\frac{5}{6}$	$3\frac{1}{4}$	$2\frac{1}{3}$	$2\frac{3}{5}$
$4\frac{3}{8}$	$11\frac{1}{2}$	$8\frac{3}{8}$	$15\frac{3}{4}$	$9\frac{15}{16}$	$10\frac{1}{6}$	$10\frac{4}{5}$

Divide. Use the remainder to give a fraction in the quotient:

12. $8\overline{)754}$ $94\frac{1}{4}$ $\quad 25\overline{)1920}$ $76\frac{4}{5}$ $\quad 33\overline{)1428}$ $43\frac{3}{11}$ $\quad 18\overline{)10319}$ $573\frac{5}{18}$ $\quad 29\overline{)11774}$ 406

Group pupils who had errors to help them analyze causes. Have them do computations aloud to help determine difficulties. Reteach if necessary.

A Problem Test

1. Jane weighed herself with her baby sister and together they weighed $87\frac{1}{4}$ lb. Jane alone weighed $70\frac{1}{2}$ lb. How much did the baby weigh? $16\frac{3}{4}$ lb.

2. Dick is practicing for a track meet. In 3 weeks he shortened his time as follows: first week, $2\frac{3}{5}$ sec.; second week, $1\frac{7}{10}$ sec.; third week, $2\frac{1}{2}$ sec. By how many seconds all together did he shorten his time in 3 weeks? $6\frac{4}{5}$

3. How much change will Mrs. Gray get from \$5.00 if she pays \$.65 for butter, \$.56 for oranges, and \$.70 a pound for $2\frac{1}{2}$ lb. of meat? \$ 2.04

4. A fast airplane flew a distance of 3135 mi. in 11 hr. Find the average number of miles it flew per hour. 285

5. Jim bought a board 9 ft. long. He sawed off $6\frac{3}{4}$ ft. of it. How many feet of board did he have left? $2\frac{1}{4}$

6. Mrs. Jackson's milk bills for the last 4 months were \$18.24, \$15.38, \$14.92, and \$16.70. What was the average cost of milk per month for the 4 months? \$ 16.31

7. For her party Susan bought $3\frac{1}{2}$ doz. rolls at \$.30 a dozen and $2\frac{1}{2}$ doz. cupcakes at \$.50 a dozen. How much did Susan pay for these things? \$ 2.30

8. Mrs. Day bought 52 yd. of material to make 16 new sheets all the same length. How many yards did she use for each sheet? $3\frac{1}{4}$ How many inches is this? 117

9. Find the cost of $\frac{3}{4}$ lb. of nuts at \$1.40 a pound. \$ 1.05

10. Ann rode her bicycle $3\frac{3}{4}$ mi., $2\frac{1}{2}$ mi., and $5\frac{3}{4}$ mi. How many miles did she ride all together? 12

Look below to find out what your score means.

SCORE	0–5 You need help	6–7 Fair	8–9 Good	10 Excellent

Correct papers and analyze errors. Discuss errors with the individuals to find out why they were made. Are pupils using all problem aids they know? Are they making errors in computations? Are they using incorrect process?

Present diagnostic tests on fraction skills.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Pages for that row.

Add. Check the work by going over it:

						Practice Pages
1.	$2\frac{1}{2}$ $3\frac{1}{4}$ $1\frac{7}{8}$ $7\frac{5}{8}$	$1\frac{5}{6}$ $3\frac{1}{2}$ $2\frac{2}{3}$ 8	$6\frac{1}{16}$ $2\frac{1}{8}$ $1\frac{1}{2}$ $9\frac{11}{16}$	$3\frac{5}{12}$ $2\frac{7}{12}$ $2\frac{5}{12}$ $8\frac{5}{12}$	$6\frac{1}{2}$ $2\frac{2}{5}$ $3\frac{1}{10}$ 12	208

What numbers are missing in the numerators?

2.	$9 = 8\frac{?}{5}$ 5	$7 = 6\frac{?}{12}$ 12	204
3.	$7\frac{1}{2} = 6\frac{?}{2}$ 3	$8\frac{2}{3} = 7\frac{?}{3}$ 5	206
4.	$4\frac{5}{6} = 4\frac{?}{12}$ 10 $= 3\frac{?}{12}$ 22	$3\frac{3}{8} = 3\frac{?}{16}$ 6 $= 2\frac{?}{16}$ 22	215

Subtract. Check your work by going over it:

5.	$2\frac{5}{6}$ $\frac{1}{2}$ $2\frac{1}{3}$	$6\frac{7}{8}$ $3\frac{1}{4}$ $3\frac{5}{8}$	$5\frac{11}{12}$ $3\frac{2}{3}$ $2\frac{1}{4}$	$3\frac{3}{4}$ $2\frac{9}{16}$ $1\frac{3}{16}$	$4\frac{3}{5}$ $3\frac{1}{10}$ $1\frac{1}{2}$	196
6.	1 $\frac{3}{8}$ $\frac{5}{8}$	1 $\frac{5}{6}$ $\frac{1}{6}$	8 $\frac{7}{10}$ $7\frac{3}{10}$	3 $1\frac{11}{16}$ $1\frac{5}{16}$	6 $4\frac{5}{12}$ $1\frac{7}{12}$	203, 204
7.	$4\frac{1}{6}$ $2\frac{5}{6}$ $1\frac{1}{3}$	$9\frac{1}{3}$ $7\frac{2}{3}$ $1\frac{2}{3}$	$5\frac{3}{16}$ $4\frac{11}{16}$ $\frac{1}{2}$	$7\frac{1}{10}$ $3\frac{9}{10}$ $3\frac{1}{5}$	$8\frac{5}{12}$ $5\frac{11}{12}$ $2\frac{1}{2}$	206, 207
8.	$5\frac{1}{8}$ $2\frac{3}{4}$ $2\frac{3}{8}$	$9\frac{1}{2}$ $5\frac{5}{6}$ $3\frac{2}{3}$	$6\frac{5}{12}$ $2\frac{2}{3}$ $3\frac{3}{4}$	$8\frac{1}{4}$ $4\frac{9}{16}$ $3\frac{11}{16}$	$9\frac{1}{2}$ $6\frac{9}{10}$ $2\frac{3}{5}$	214, 215

Find the answers. Be sure to check your work:

9.	$\frac{3}{4}$ of 48 36	$\frac{5}{8}$ of 120 75	$\frac{3}{5}$ of \$1.00 \$.60	217
10.	$\frac{3}{8} \times 96$ 36	$\frac{3}{4} \times 180$ 135	$\frac{2}{3} \times \$2.34$ \$1.56	219
11.	$2\frac{3}{4} \times 76$ 209	$1\frac{3}{8} \times 144$ 198	$4\frac{3}{5} \times \$5.00$ \$23.00	220

Urge pupils to make self-assignments from practice pages. If reteaching is indicated, use developmental material found on pages related to pupils' difficulties.

See G-79 for specific aims of Chapter 7 and suggestions for teaching decimals.

Chapter 7

Dick's New Bicycle

Teach meaning and use (see G-79) of decimal fraction "tenths."

1. Dick has a new bicycle with a speedometer on it. The speedometer tells Dick how fast and how far he rides. When Dick starts to ride, the number shown on the speedometer is 000 0. After he rides 1 tenth of a mile the number changes to 000 1. After he rides another tenth of a mile it changes to 000 2. Each tenth of a mile the number changes as shown in the table. The red numbers show tenths of a mile. When 10 tenths comes up the 0 is in tenths column and the 1 in the column to the left. This shows that 10 tenths of a mile equals 1 whole mile. If possible try to display measuring instruments (cyclometer, odometer) or pictures of them for discussion.

000 0
000 1
000 2
000 3
000 4
000 5
000 6
000 7
000 8
000 9
001 0
001 1

2. The last number in the table is 001 1 and it is read 1 and 1 tenth. Can you write and read the next three numbers that come after 1 and 1 tenth? 0012, 1 and 2 tenths; 0013, 1 and 3 tenths; 0014, 1 and 4 tenths

3. There are two ways to write 1 and 1 tenth with figures. One way is $1\frac{1}{10}$ and the other is 1.1. The first way uses a common fraction and the second, a decimal fraction. On the next pages you will learn more about decimal fractions.

After discussing ex. 1–3 with pupils, reinforce meaning of tenths by using materials (whole squares or circles and some cut into tenths). Have pupils count by tenths and record counting as .1 and $\frac{1}{10}$, .2 and $\frac{2}{10}$, . . . , 1.1 and $1\frac{1}{10}$, and so on.

Teach meaning of "hundredths," common fraction, and decimal fraction. Point out that it is easier to see relationship between common and decimal fractions if denominators of common fractions are left as 10, 100, and so on.

Learning about Decimals

1. On page 225 you learned that 10 tenths of a mile is the same as 1 whole mile. Numbers less than 10 tenths are only part of 1 whole. .8 is less than 1 and is called a Emphasize **decimal fraction** or a **decimal.** $\frac{8}{10}$ is also less than 1 and is called a **common fraction.** Emphasize.

2. You have learned that the denominator of a common fraction tells into how many equal parts a thing has been divided. The numerator shows how many of those parts you are to use. If you divide an orange into 4 equal parts and eat 3 parts, you have eaten $\frac{3}{4}$ of the orange. If your mother cuts a pie into 6 equal pieces and the family eat 5 pieces, what part of the pie did the family eat? $\frac{5}{6}$

Stress **3.** In decimal fractions only the numerator is written. The denominator is always 10, or 100, or 1000, and so on. So .7 means $\frac{7}{10}$ and is read "7 tenths." Also, .29 means $\frac{29}{100}$ and is read "29 hundredths." 3.65 means $3\frac{65}{100}$ and is read "3 **and** 65 hundredths."

4. In English you use a period to show where one sentence ends and another begins. In decimals you use a period, or decimal point, to show where a whole number ends and a decimal begins. The decimal point separates the whole number from the decimal. Emphasize.

5. Just as there are whole numbers of one, two, and three places, and so on, there are decimals of one, two, and three places. The names of some of the places are shown below.

	Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths	
(a)	2	6	4	.	3	6	$264\frac{36}{100}$
(b)		1	2	.	7		$12\frac{7}{10}$
(c)			5	.	9		$5\frac{9}{10}$
(d)			8	.	0	9	$8\frac{9}{100}$

Review place value. Show that decimal fractions are extension of place value to right of decimal point; same tens relationship exists, but applies to denominators ($\frac{1}{10}$ is 10 times larger than $\frac{1}{100}$).

Since the smallest denominator of a decimal fraction is 10, the first place to the right of the decimal point is called **tenths.** The next denominator is 100, so the second place is **hundredths.** Can you tell what the next place is called? Thousandths

6. In ex. 5 part (a) the number is read "two hundred sixty-four **and** thirty-six hundredths"; part (b) is read "twelve **and** seven tenths." Notice that you say **and** only between a whole number and a decimal fraction or common fraction. The name of the last place in the decimal tells the denominator and all the figures after the decimal point tell the numerator. Read the numbers in (c)(1) and (d),(2) ex. 5. (1) Five and nine tenths; (2) eight and nine hundredths

7. The number 4.83, which is made up of a whole number and a decimal, is a **mixed decimal,** just as $4\frac{83}{100}$ is a mixed number. In business and science, 4.83 is sometimes read "four point eight three." Point out that "mixed decimal" means mixed decimal fraction.

8. Sometimes .4 is written 0.4, the zero being put before the decimal point to make sure that the decimal point is not overlooked. In business decimal fractions are being used more widely each year, while common fractions are being used less often.

Have pupils write these as common fractions.

Read these numbers:

See G-80 for ex.10

	Three tenths	Five tenths	One and eight tenths	Forty-six hundredths	Thirty-two hundredths	Four and seventy-two hundredths	Three dollars and fifty-seven cents
9.	.3	0.5	1.8	.46	0.32	4.72	$3.57
10.	.8	0.1	4.9	.35	0.74	1.37	$4.68
11.	.6	0.7	3.1	.89	0.65	8.23	$1.25
	Six tenths	seven tenths	Three and one tenth	Eighty-nine hundredths	Sixty-five hundredths	Eight and twenty-three hundredths	One dollar and twenty-five cents

12. In class the children told where they had seen decimals used. Here are some of the things they told:

The paper said that there was 0.46 in. of rain yesterday.

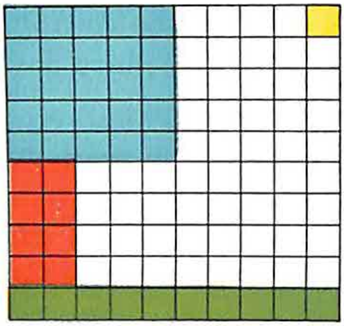
Bill said that time at a track meet is measured in tenths of a second.

Betty's father bought gas today and it was measured in tenths of a gallon.

13. Try to find other places where decimals are used and tell the class about them. Have pupils illustrate uses (pictures, tables).

Have pupils make own place-value chart (as in ex. 5 on page 226) to use to read and write other decimal fractions and mixed decimals, dictated by you. Also have pupils locate mixed decimals on decimal number line.

Reading and Writing Decimals



1. How many blocks are there in the big square at the left? 100 What part of the big square is colored yellow? (1) What part is colored red? (2) blue? (3) green? (4) What part of the square is not colored at all? (5) Write the answers both as fractions and as decimals. (1) $\frac{1}{100}$ or .01; (2) $\frac{8}{100}$ or .08; (3) $\frac{25}{100}$ or .25; (4) $\frac{10}{100}$ or .10; (5) $\frac{56}{100}$ or .56

2. How many rows of blocks are there in the big square in ex. 1? 10 One row is what part of the whole square? $\frac{1}{10}$ or .1 Bill thought, "There are 10 rows in the big square. 1 row is $\frac{1}{10}$ of the square." He wrote .1. Mary said, "There are 100 blocks in the big square and 10 blocks in each row. 1 row is $\frac{10}{100}$ of the big square." She wrote .10. Are Bill and Mary both right? Yes Does $\frac{1}{10} = \frac{10}{100}$? Yes Tell how you know these are equal fractions. This shows that .1 = .10.

As pupils read decimal fractions be sure they say "tenths" or "hundredths," not ten or hundred.

Read each of these numbers:

3. 4.5 in. Four and five tenths   .75 in. Seventy-five hundredths   0.48 Forty-eight hundredths   0.4 Four tenths   38.7 Thirty-eight and seven tenths   2.00 Two and no hundredths

Have pupils read them.

Write each number as a decimal or a mixed decimal:

4. $\frac{7}{10}$ .7 $\frac{59}{100}$ .59 $\frac{6}{10}$ .6 $5\frac{3}{100}$ 5.03 $18\frac{8}{10}$ 18.8 $37\frac{27}{100}$ 37.27

5. $\frac{5}{10}$ .5 $\frac{67}{100}$ .67 $\frac{1}{10}$ .1 $9\frac{1}{100}$ 9.01 $43\frac{9}{10}$ 43.9 $14\frac{86}{100}$ 14.86

Write each number as a common fraction or a mixed number:

6. .5 $\frac{5}{10}$ .24 $\frac{24}{100}$ 18.3 $18\frac{3}{10}$ 4.75 $4\frac{75}{100}$ 9.08 $9\frac{8}{100}$ 15.7 $15\frac{7}{10}$

7. .2 $\frac{2}{10}$ .63 $\frac{63}{100}$ 12.6 $12\frac{6}{10}$ 8.39 $8\frac{39}{100}$ 4.60 $4\frac{60}{100}$ 34.8 $34\frac{8}{10}$

Write these numbers in figures:

8. Six hundred fifty-five and four tenths. 655.4

9. Eight hundred fifteen and forty-six hundredths. 815.46

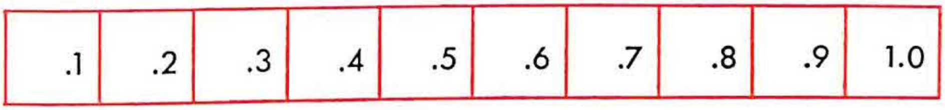
10. Four hundred thirty-seven and nine hundredths. 437.09

Use diagram above to make visual comparison between $\frac{1}{10}$ (.1) and $\frac{1}{100}$ (.01), and to re-emphasize that position of number to right of decimal point tells the denominator. Relate history of common and decimal fractions; see G-81.

Continue practice in reading and writing decimal fractions. Show how to convert common fraction to decimal fraction.

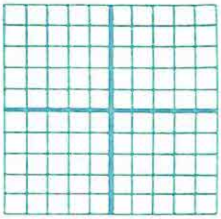
Fractions and Decimals

1. Cut two strips of paper each 10 in. long and 1 in. wide. Mark each one into 1-inch blocks. How many blocks do you have? 20 Each block is what part of the strip? $\frac{1}{10}$ or .1 Mark the tenths as shown below.



2. Fold the ends of one strip together so that the strip is divided into two equal parts. Can you show from this strip that $\frac{1}{2} = .5$?

3. Take the second strip and fold it carefully at the .2, .4, .6, and .8 marks. Into how many equal parts is this second strip folded? 5 What is the length of each part? .2 Can you show that $\frac{1}{5} = .2$? $\frac{3}{5} = .6$? $\frac{4}{5} = .8$?



4. The heavy lines in the square at the right show where it has been folded. Can you show from these folds that $\frac{1}{4} = .25$?

5. It is easy to change a fraction to a decimal if you can change the fraction to an equal fraction with a denominator of 10 or 100. If you change $\frac{17}{20}$ to a decimal, by what must you multiply 20 to get 100? 5 Then multiply both numerator and denominator by 5, which gives $\frac{85}{100}$. $\frac{85}{100}$ can be written .85. So $\frac{17}{20} = .85$.

$$\frac{17 \times 5}{20 \times 5} = \frac{85}{100} = .85$$

Change these fractions to decimals:

6. $\frac{1}{5}$ .2 $\frac{1}{10}$ .1 $\frac{11}{25}$ .44 $\frac{7}{10}$ .7 $\frac{37}{50}$ .74 $\frac{13}{20}$ .65 $\frac{29}{50}$ .58 $\frac{9}{10}$ .9

7. $\frac{3}{5}$ .6 $\frac{7}{50}$ .14 $\frac{22}{25}$ .88 $\frac{9}{20}$ .45 $\frac{47}{50}$ .94 $\frac{11}{20}$ .55 $\frac{17}{25}$ .68 $\frac{19}{50}$ .38

8. $\frac{1}{2}$ .5 $\frac{18}{25}$ .72 $\frac{7}{20}$ .35 $\frac{13}{50}$ .26 $\frac{21}{25}$ .84 $\frac{3}{10}$ .3 $\frac{16}{25}$ .64 $\frac{19}{20}$ .95

9. $\frac{1}{4}$ .25 $\frac{24}{25}$ .96 $\frac{41}{50}$ .82 $\frac{19}{25}$ .76 $\frac{3}{20}$ .15 $\frac{6}{25}$ .24 $\frac{33}{50}$ .66 $\frac{23}{25}$ .92

Have pupils perform actions in ex. 1-3. Provide pupils with squares similar to one in ex. 4 (use graph paper). Have them use it to show other decimal and common fractions.

Adding and Subtracting Decimals

1. Mr. Lane asked Jane and Bob to check the amount of gasoline he bought last week. He got 8.9 gal. on Monday, 10.4 gal. on Thursday, and 7.6 gal. on Saturday.

Jane's Way	Bob's Way
$8\frac{9}{10}$	8.9
$10\frac{4}{10}$	10.4
$7\frac{6}{10}$	7.6
$25\frac{19}{10} = 26\frac{9}{10}$	26.9

You see that Jane and Bob both got the same answer. Jane used common fractions and Bob used decimal fractions. Notice that Bob kept the decimal points in a straight line so that he was adding tenths to tenths, ones to ones, and so on. Reinforce by showing example on place-value diagram.

2. This week Mr. Lane bought 30 gal. of gasoline. How much more did he buy this week than last week? $3\frac{1}{10}$ or 3.1

Jane's Way	Bob's Way
$30 = 29\frac{10}{10}$	30.0
$26\frac{9}{10} = 26\frac{9}{10}$	26.9
$3\frac{1}{10}$	3.1

Since Mr. Lane bought exactly 30 gal., Bob wrote 30.0, which means 30 and no tenths. Then he subtracted. He put the decimal point in the answer under the other decimal points, as he did in the addition in ex. 1.

Stress that tenths are added to (or subtracted from) tenths, ones to ones, and so on, in ex. 3–6.

Add these numbers and check your work:

3.	5.2 3.6 8.8	4.3 2.9 7.2	79.7 32.1 111.8	62.4 53.5 115.9	32.0 18.2 50.2	189.5 144.7 334.2
4.	5.4 3.8 9.2	6.7 2.9 9.6	90.0 76.7 166.7	30.6 30.2 60.8	45.8 25.9 71.7	754.8 288.8 1043.6
5.	6.3 4.5 10.8	4.6 0.9 5.5	52.9 24.8 77.7	89.6 38.8 128.4	71.8 48.6 120.4	730.0 165.9 895.9

6. Subtract the numbers in ex. 3–5 and check your work. Ex. 3: 1.6, 1.4, 47.6, 8.9, 13.8, 44.8; ex. 4: 1.6, 3.8, 13.3, 0.4, 19.9, 466.0; ex. 5: 1.8, 3.7, 28.1, 50.8, 23.2, 564.1

More Practice. See ㊹ on page 325.

Use place pocket chart to show exchange and regrouping in ex. 1–2. Stress that we can add and subtract decimal fractions because denominators are alike (tenths). Have pupils redo some examples in ex. 3–5 using mixed numbers.

Problems with Decimals

1. Jim can swim the length of the swimming pool in 42.5 sec. It takes Joe only 39.8 sec. Jim needs how many more seconds than Joe to swim the length of the pool? 2.7

2. The children in the Bicycle Club rode 5.6 mi. on Thursday, 8.4 mi. on Friday, and 12.7 mi. on Saturday. How far did they ride in the three days? 26.7 mi.

3. Jack helped his father measure for a new garage. It will be 9.8 ft. wide and 14.3 ft. long. It will be how much longer than it is wide? 4.5 ft.

4. Ann's temperature was 102.3° when she was sick. When she is well her temperature is 98.6°. Ann's temperature was how many degrees above what it should be? 3.7°

5. With his old car Mr. Brown averaged 16.4 mi. to a gallon of gasoline. With his new car he averages 21.1 mi. per gallon. How many more miles per gallon does he get from his new car than from the old one? 4.7

6. Susan kept a record of the distance she and her family traveled each week of their vacation last summer. During 4 weeks they traveled 763.6 mi., 847.5 mi., 663.4 mi., and 472.9 mi. How far did they travel in the 4 weeks? 2747.4 mi.

7. At one end of our swimming pool the water is 3.7 ft. deep. At the other end it is 10.4 ft. deep. How much deeper is it at one end than at the other? 6.7 ft.

8. Jim keeps a record of the butterfat he gets from his 2 cows, Polly and Brownie. Here are figures for 3 months:

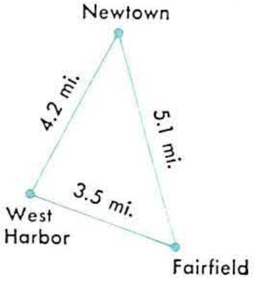
	Polly		Brownie
January	52.6 lb.	January	51.3 lb.
February	48.6 lb.	February	47.5 lb.
March	51.3 lb.	March	50.8 lb.
	152.5 lb.		149.6 lb.

Find the number of pounds each cow gave in the 3 months. How many more pounds did Polly give than Brownie? 2.9

Urge pupils to note uses of decimal fractions in everyday living (ex. 1: stop watches; ex. 2, 5, 6: mileage; ex. 3, 7: decimalized ruler, not common but can be bought; ex. 4: clinical thermometers; ex. 8: butterfat measure).

Give further practice on addition of decimals (tenths).

How Far Did They Ride?



1. Last Saturday the Bicycle Club rode from Fairfield to West Harbor, then to Newtown, and back to Fairfield. At the left you see that they rode 3.5 mi., 4.2 mi., and 5.1 mi. How far did they ride in all? 12.8 mi.

2. At noon they had a picnic at a place 1.5 mi. beyond West Harbor. How far did they ride before they had the picnic? 5.0 mi.

3. After they had the picnic they rode to Newtown and then back to Fairfield. How far did they ride after they had the picnic? 7.8 mi.

4. How much farther is it from Fairfield to Newtown than from Fairfield to West Harbor? 1.6 mi.

Add these numbers and check your work:

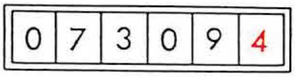
5.	6.7 6.7 13.4	9.8 4.5 14.3	63.0 48.6 111.6	58.6 25.9 84.5	246.6 23.6 270.2	539.7 246.5 786.2
6.	8.8 6.4 15.2	5.4 5.9 11.3	42.4 46.8 89.2	85.9 24.9 110.8	178.6 87.8 266.4	999.7 237.6 1237.3

Remind pupils that tenths are added to tenths, ones to ones, and so on. Stress placement of decimal point. Let pupils make up own problems, using ex. 5–6.

Give further practice on subtraction of decimals (tenths).

Measuring Distances in a Car

1. When Jim Hall rides in his father's car he likes to watch the **speedometer.** A speedometer shows both the speed of the car and the distance it goes. The part of the speedometer showing distance is pictured at the right. This shows that the car has gone 7309.4 mi. The right-hand figure shows **tenths** of a mile and is printed in red.



2. The speedometer of Mr. Hall's car read 7309.4 mi. before a trip and 7824.0 mi. after the trip. How many miles did Mr. Hall drive on the trip? 514.6

▶ The number of miles Mr. Hall drove is the difference between 7309.4 mi. and 7824.0 mi.

3. On Monday night when Mr. Hall came back from the trip, the speedometer read 7824.0 mi. On Tuesday night it read 7910.6 mi. On Wednesday night it read 8031.4 mi. How many miles did Mr. Hall drive on Tuesday? 86.6 on Wednesday? 120.8

4. Mr. Hall had to drive to Greenfield on Thursday. The map showed that the round trip would be 147.8 mi. If the speedometer read 8031.4 mi. when he left, what should it read when he returned? 8179.2 mi.

5. Mr. Hall's speedometer read 8181.6 mi. when he returned from Greenfield. What is the difference between that reading and your answer to ex. 4? 2.4 mi. How do you account for this difference? Mr. Hall probably rode around in the town.

Subtract. Check your work by adding:

6.	2736.5	3818.4	7483.7	2153.3	7007.0
	1294.8	2509.9	5226.8	1944.1	4376.9
	1441.7	1308.5	2256.9	209.2	2630.1
7.	1896.7	4520.5	6335.9	1570.3	8520.2
	929.4	3582.5	3360.5	884.0	6376.9
	967.3	938.0	2975.4	686.3	2143.3
8.	7620.0	3333.3	8321.8	2443.5	8525.5
	3922.6	1745.8	7849.4	1457.2	3657.6
	3697.4	1587.5	472.4	986.3	4867.9

Do ex. 1-5 orally with pupils, letting different ones explain how to solve problems. Let pupils do ex. 6-8 independently. Note if regrouping causes difficulty (re-explain, using pocket chart).

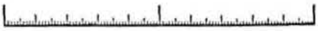
Show how rainfall is measured to hundredths of an inch.

Measuring Rainfall

Extend addition and subtraction of decimals to hundredths.

1. The amount of rain that falls is measured in inches. If you want to know how much rain falls during a storm, put a pan outdoors to catch the rain. When the storm is over, measure the water to see how deep it is; if it is $\frac{1}{2}$ in. deep, you say that $\frac{1}{2}$ in. of rain fell. When the Weather Bureau reports the amount of rain it will state that .50 in. fell, since the Weather Bureau measures rain to **hundredths** of an inch.

2. When measurements are made to hundredths of an inch, the inch is divided into 100 parts as shown at the right. This picture has been made more than 1 in. long so it will be easy to read.



3. In the picture in ex. 2, some of the lines are longer than others. Show which lines stand for tenths. How many hundredths in 1 tenth? 10 in 2 tenths? 20 in 7 tenths? 70

4. Look at the picture of an inch shown above in ex. 2. How many hundredths of an inch are there in 1 whole inch? 100 You see that 1 whole equals 100 hundredths. You can write it like this: $1 = \frac{100}{100} = 1.00$. You also see that 1 whole equals 10 tenths. This is written $1 = \frac{10}{10} = 1.0$. This means that $1 = 1.0 = 1.00$. Does $2 = 2.0 = 2.00$? Yes

Follow development as given on pages 234–235, doing examples orally with pupils. Try to develop idea of size of $\frac{1}{100}$ in. through ex. 2 illustration. Have pupils bring in and read weather reports, listing rainfall.

Use place pocket chart and/or place-value diagram to show addition and subtraction in ex. 5-10, if necessary.

5. After two days of heavy rain the Weather Bureau said that 2.52 in. of rain fell the first day and 1.48 in. fell the second day. How many inches of rain fell on both days? You might say that 4 in. of rain fell, but the Weather Bureau would say 4.00 in. of rain fell. This shows that they had measured it to hundredths of an inch.

6. Jack read that the usual rainfall in Alaska for a year is 90.25 in. The usual rainfall where Jack lives is only 11.48 in. per year. How many more inches of rain usually fall in Alaska in a year than in Jack's city? 78.77

7. Here are the amounts of rainfall in Jack's city for the last 6 mo.: 1.12 in., .81 in., .24 in., .21 in., .56 in., 1.33 in. How many inches of rain is this all together? 4.27

8. In California two weather stations reported these amounts of rainfall for a recent year: 14.54 in. and 20.51 in. What is the difference in the amounts of rainfall? 5.97 in.

9. In New York two weather stations reported these amounts of rainfall for the year mentioned in ex. 8: 35.81 in. and 42.03 in. What is the difference in these amounts? 6.22 in.

10. In Ashland 9.55 in. of rain fell last June, causing a flood. The average rainfall for June in that city is 3.97 in. How many inches above the average was last June's rainfall? 5.58

Continue work of pages 234-235. Give further practice on addition and subtraction of decimals (tenths, hundredths).

Measuring Rainfall

1. The picture at the left shows a rain gauge which the Weather Bureau uses to measure rainfall. The rain enters at the top of the gauge and passes through the funnel which is on the inside. Each time .01 in. of rain gathers in the gauge, it is recorded by electricity. If possible, plan class visit to Weather Bureau in your city to see instrument that measures rainfall.

2. At Washington one day in April the rain gauge showed that .92 in. of rain fell during the first hour of a storm and .78 in. fell during the second hour. How many inches of rain fell in those two hours? 1.70

3. The rainfall in Philadelphia for one whole year was 42.41 in. The rainfall in Boston that year was 40.58 in. How many fewer inches fell in Boston than in Philadelphia? 1.83

Add these numbers and check your work:

4.	.19 .28 .47	4.16 5.38 9.54	0.25 4.77 5.02	66.57 13.08 79.65	49.12 36.17 85.29	260.13 172.49 432.62
5.	.47 .59 .15 1.21	7.87 3.68 2.37 13.92	0.48 0.73 0.26 1.47	19.88 25.93 24.35 70.16	14.58 42.77 24.59 81.94	369.39 156.23 275.54 801.16

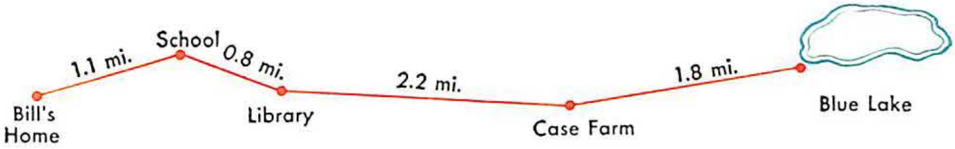
Subtract these numbers and check your work:

6.	.58 .32 .26	8.62 4.93 3.69	8.50 5.96 2.54	44.39 28.92 15.47	40.20 18.92 21.28	121.03 39.53 81.50
7.	.62 .24 .38	6.08 0.39 5.69	7.13 3.75 3.38	70.36 45.89 24.47	33.18 25.43 7.75	554.82 356.27 198.55

More Practice. See ㊺ on page 325.

Remind pupils that hundredths are added to (or subtracted from) hundredths, tenths to tenths, ones to ones, and so on. Let different pupils explain work in ex. 4-7 on board. Use "More Practice" for reteaching if needed.

Decimal Practice



1. The map above shows the road from Bill's home to Blue Lake. How far does Bill ride on his bicycle when he rides to Blue Lake? 5.9 mi.

2. Suppose Bill rides from home to Blue Lake and back the same day. How far does he ride? 11.8 mi.

3. How far is it from school to the Case Farm? 3.0 mi. from Bill's home to the library? 1.9 mi. from school to Blue Lake? 4.8 mi.

Copy these numbers in columns and add them:

4. 8.34, 9.12, .57, 6.35, 4.29 28.67 436.5, 187.6 624.1

5. .95, 6.74, 3.97, .86, 5.04 17.56 224.4, 350.8 575.2

6. 54.1, 7.5, 69.3, 6.8, 65.3 203.0 89.89, 63.57 153.46

Add up. Check by adding down:

7.	9.1	34.7	76.8	8.79	8.05	4.86
	4.5	20.1	37.9	2.27	2.82	3.21
	3.8	44.5	43.5	4.97	6.48	6.87
	17.4	99.3	158.2	16.03	17.35	14.94
8.	5.3	33.0	61.7	1.43	.59	9.63
	7.7	24.6	56.4	8.76	2.07	2.34
	1.0	10.4	41.5	3.40	1.16	.65
	14.0	68.0	159.6	13.59	3.82	12.62

Subtract. Check by adding up:

9.	9.3	82.1	71.4	5.35	8.52	1.35
	7.8	64.2	61.5	1.65	5.63	.97
	1.5	17.9	9.9	3.70	2.89	.38
10.	8.5	46.7	92.2	5.20	6.67	5.20
	6.3	37.7	45.2	3.68	4.99	4.92
	2.2	9.0	47.0	1.52	1.68	.28
11.	7.2	48.6	92.0	2.43	7.00	5.35
	2.4	28.8	83.7	1.95	3.43	2.66
	4 8	19.8	8.3	.48	3.57	2.69

Do ex. 1-3 with pupils. They might also enjoy drawing own maps and making up questions about their maps for class to answer. Plan reteaching, as needed, based on work in ex. 4-11.

Show use of decimal fractions in railroad timetable.

A Trip by Train

Miles		A A.M.	B A.M.	C P.M.	D P.M.
0.0	Lake City	5:10	8:10	**1:34**	**7:25**
41.1	Forest Hills	5:54	8:56	**2:23**	**8:13**
87.7	Stony Point	6:40	9:48	**3:17**	**9:08**
128.5	Snowshoe	7:27	10:38	**4:05**	**9:57**
185.1	Big Rock	8:48	12:00	**5:31**	**11:27**
291.7	Queenstown	11:34	**2:52**	**8:31**	2:47

1. Bob lives in Lake City. He was looking at a timetable of trains from Lake City to Queenstown. A part of the table is shown above. The left-hand column of the table shows how many miles each station is from Lake City. These distances are given to **tenths** of a mile. How many miles is it from Lake City to Queenstown? 291.7 from Forest Hills to Stony Point? 46.6 from Stony Point to Snowshoe? 40.8 from Stony Point to Big Rock? 97.4 from Snowshoe to Big Rock? 56.6 from Big Rock to Queenstown? 106.6

2. If Bob's father goes by train from Lake City to Queenstown and back again, how many miles does he travel? 583.4

3. The columns at the right show the hours when trains leave Lake City for Queenstown. The first train leaves at 5:10 A.M. At what time does it arrive in Queenstown? 11:34 A.M. How long does the trip from Lake City to Queenstown take? 6 hr. 24 min. (train A)

Emphasize. ▶ In the table, hours in the morning (before noon) are printed in light type like this: 5:10. Hours in the afternoon and evening (up to midnight) are printed in dark type like this: **2:52.**

4. Find the time that each of the other trains takes to go from Lake City to Queenstown. B, 6 hr. 42 min.; C, 6 hr. 57 min.; D, 7 hr. 22 min. Which is the fastest trip? Train A

5. How long does each train take to go from Stony Point to Big Rock? (1) from Stony Point to Queenstown? (2) (1) A, 2 hr. 8 min.; B, 2 hr. 12 min.; C, 2 hr. 14 min.; D, 2 hr. 19 min.; (2) A, 4 hr. 54 min.; B, 5 hr. 4 min.; C, 5 hr. 14 min.; D, 5 hr. 39 min.

6. Bring to class a timetable for a bus or railroad and show the class how to read it.

Try to provide pupils with real timetables and give further practice in reading them. Lead pupils to see that by subtracting mileages and times they can compute distance they will travel and time journey will take.

Review basic skills in whole numbers.

Keeping in Practice

Multiply and check your work: Stress checking.

1. 613 × 829 508,177 ✓ 257 × 340 87,380 ✓ 394 × 415 163,510 ✓ 460 × 347 159,620 ✓

2. 705 × 705 497,025 ✓ 479 × 829 397,091 ✓ 816 × 837 682,992 ✓ 582 × 682 396,924 ✓

3. 148 × 560 82,880 ✓ 800 × 978 782,400 ✓ 600 × 793 475,800 ✓ 319 × 743 237,017 ✓

4. Find the cost of 25 radios at $49.95 each. $1248.75

5. Find the cost of 144 books at $2.50 each. $360.00

Divide. Check your work by multiplying:

6. 72)37944 527 26)12714 489 33)24628 746R10 28)26516 947

7. 56)39032 697 18)14076 782 25)20850 834 37)31254 844R26

8. 19)13058 687R5 31)19245 620R25 57)40812 716 46)16744 364

9. 47)34768 739R35 35)30345 867 74)37222 503 58)20184 348

10. At 24 for $3.60, find the cost of 1 chocolate bar. $.15

Copy in columns, add, and check:

11. 657 + 210 + 196 + 473 1536 2674 + 1908 + 6633 11,215

12. 386 + 425 + 819 + 596 2226 7997 + 6538 + 5489 20,024

13. 394 + 508 + 470 + 198 1570 2689 + 8735 + 4024 15,448

14. 357 + 445 + 574 + 807 2183 5141 + 3923 + 6356 15,420

Subtract and check your work:

15.	38515 34588 3927	65226 47554 17,672	71748 53689 18,059	90000 55744 34,256	85466 76959 8507
16.	46312 29836 16,476	96627 92636 3991	80000 53687 26,313	72012 27214 44,798	17851 9722 8129

17. At the grocery store Betty spent $.85, $1.07, $.55, $.24, and $.72. She gave the man $5.00. How much was her change? $1.57

After checking papers and analyzing errors, group pupils who had mistakes for discussion of their errors. Also note if pupils are checking properly (not just making check work out). Let others work at arithmetic corner.

Present mixed problems dealing with trade in 18th century.

Trading in Early Days

In the early years of our country most people lived on farms. They had little real money, so they traded the things they had in plenty for other things they needed. Most people used corn, tobacco, and the skins of wild animals as money.

1. In one town a storekeeper traded 144 bu. of corn for 6 barrels of salt pork. How many bushels of corn would pay for 1 barrel of salt pork at that time? 24
2. In New York State 1 beaver skin would buy 8 lb. of gunpowder. In Canada 1 beaver skin would buy only 4 lb. of gunpowder. The value of the gunpowder was the same in both places. In which place, New York State or Canada, did beaver skins have more value? New York State
3. Mrs. Wood could buy 1 yd. of cloth with 8 bu. of corn. She needed $6\frac{1}{2}$ yd. of cloth for a dress. How many bushels of corn did Mrs. Wood need to trade for the cloth? 52
4. A doctor in the South was paid 200 lb. of tobacco for making 3 visits after dark to a sick family. On the average, how many pounds of tobacco were paid for 1 visit? $66\frac{2}{3}$

After pupils complete problems urge them to compare present-day trade, clothing, and so on, with similar aspects of other times.

5. In some parts of the country the values of skins were given in shillings. For example, a fox skin was worth 3 shillings; a bear skin, 10 shillings; a beaver skin, 18 shillings. To buy a shovel Tom Brown had to pay 1 fox skin, 1 bear skin, and 1 beaver skin. How many shillings was the shovel worth? 31

6. Suppose Tom Brown had had no beaver skin. He did have fox skins and 1 bear skin. How many fox skins would he have needed to put with the bear skin in that case? 7

7. John Green built a barn and was paid 46 beaver skins for his work. John sold all the beaver skins for 18 shillings each. How many shillings did he get for them? 828

8. Raccoon skins and deerskins were used in trade in one part of our country. A raccoon skin was valued at 1 shilling and a deerskin at 6 shillings. What was the value of 3 deerskins and 3 raccoon skins? 18 shillings How many yards of cloth at 3 shillings a yard could be bought for 3 deerskins and 3 raccoon skins? 7

9. Mrs. White had no deerskins. How many raccoon skins did she need to buy 6 yd. of cloth at 3 shillings a yard? 18

Fraction Review

1. Add $4\frac{1}{3}$ to each: $5\frac{1}{6}$, $9\frac{1}{2}$ $3\frac{5}{6}$, $8\frac{1}{6}$ $2\frac{11}{12}$, $7\frac{1}{4}$ $7\frac{1}{2}$, $11\frac{5}{6}$ $9\frac{3}{4}$, $14\frac{1}{12}$ $4\frac{2}{3}$, 9 $6\frac{5}{12}$. $10\frac{3}{4}$

2. Add $1\frac{7}{12}$ to each: $4\frac{5}{12}$, 6 $2\frac{1}{2}$, $4\frac{1}{12}$ $6\frac{3}{4}$, $8\frac{1}{3}$ $2\frac{2}{3}$, $4\frac{1}{4}$ $3\frac{5}{6}$, $5\frac{5}{12}$ $8\frac{1}{4}$, $9\frac{5}{6}$ $5\frac{11}{12}$. $7\frac{1}{2}$

3. Add $3\frac{1}{2}$ to each: $3\frac{1}{4}$, $6\frac{3}{4}$ $6\frac{5}{6}$, $10\frac{1}{3}$ $5\frac{3}{8}$, $8\frac{7}{8}$ $1\frac{7}{10}$, $5\frac{1}{5}$ $4\frac{11}{16}$, $8\frac{3}{16}$ $2\frac{1}{3}$, $5\frac{5}{6}$ $2\frac{5}{12}$. $5\frac{11}{12}$

4. Bill rode $3\frac{3}{4}$ mi. and walked $\frac{3}{4}$ mi. to get to camp. How many miles did he go all together? $4\frac{1}{2}$

Add. Check by going over your work:

5. $1\frac{1}{2}$	$4\frac{3}{4}$	$5\frac{1}{2}$	$6\frac{1}{4}$	$1\frac{1}{4}$	$3\frac{7}{10}$	$7\frac{1}{6}$
$2\frac{1}{3}$	$\frac{1}{2}$	$1\frac{1}{3}$	$2\frac{5}{16}$	$1\frac{2}{3}$	$1\frac{1}{2}$	$2\frac{2}{3}$
$1\frac{1}{6}$	$1\frac{3}{8}$	$4\frac{1}{3}$	$2\frac{7}{8}$	$1\frac{5}{12}$	$4\frac{3}{5}$	$3\frac{7}{12}$
5	$6\frac{5}{8}$	$11\frac{1}{6}$	$11\frac{7}{16}$	$4\frac{1}{3}$	$9\frac{4}{5}$	$13\frac{5}{12}$

6. Subtract $2\frac{1}{2}$ from each: $7\frac{3}{4}$, $5\frac{1}{4}$ $6\frac{9}{10}$, $4\frac{2}{5}$ $8\frac{5}{12}$, $5\frac{11}{12}$ $3\frac{5}{16}$, $\frac{13}{16}$ $9\frac{1}{6}$, $6\frac{2}{3}$ $4\frac{1}{10}$. $1\frac{3}{5}$

7. Subtract $1\frac{7}{16}$ from each: $6\frac{11}{16}$, $5\frac{1}{4}$ 5, $3\frac{9}{16}$ $9\frac{3}{4}$, $8\frac{5}{16}$ $4\frac{1}{8}$, $2\frac{11}{16}$ $7\frac{1}{2}$, $6\frac{1}{16}$ $3\frac{3}{16}$. $1\frac{3}{4}$

8. Subtract $4\frac{7}{10}$ from each: $5\frac{9}{10}$, $1\frac{1}{5}$ 8, $3\frac{3}{10}$ $6\frac{1}{2}$, $1\frac{4}{5}$ $4\frac{4}{5}$, $\frac{1}{10}$ $9\frac{4}{5}$, $5\frac{1}{10}$ $4\frac{9}{10}$. $\frac{1}{5}$

9. Betty cut $6\frac{5}{8}$ yd. of ribbon from a roll of ribbon 15 yd. long. How many yards of ribbon were left on the roll? $8\frac{3}{8}$

Subtract. Check by going over your work:

10. $3\frac{3}{4}$	$5\frac{7}{8}$	$6\frac{1}{2}$	$8\frac{1}{2}$	$5\frac{1}{4}$	$2\frac{9}{16}$	$7\frac{5}{12}$
$1\frac{1}{4}$	$2\frac{5}{8}$	$1\frac{1}{3}$	$5\frac{5}{12}$	$\frac{11}{16}$	$1\frac{3}{4}$	$5\frac{2}{3}$
$2\frac{1}{2}$	$3\frac{1}{4}$	$5\frac{1}{6}$	$3\frac{1}{12}$	$4\frac{9}{16}$	$\frac{13}{16}$	$1\frac{3}{4}$
11. $7\frac{1}{6}$	$9\frac{1}{2}$	$4\frac{3}{8}$	$5\frac{3}{10}$	$9\frac{3}{4}$	$6\frac{2}{3}$	$8\frac{1}{2}$
$2\frac{5}{6}$	$4\frac{3}{4}$	$2\frac{3}{4}$	$1\frac{1}{2}$	$6\frac{5}{12}$	$4\frac{1}{2}$	$4\frac{9}{10}$
$4\frac{1}{3}$	$4\frac{3}{4}$	$1\frac{5}{8}$	$3\frac{4}{5}$	$3\frac{1}{3}$	$2\frac{1}{6}$	$3\frac{3}{5}$

Multiply. Check by going over your work:

12. $\frac{3}{4} \times 20$ 15 $\frac{3}{8} \times 32$ 12 $1\frac{1}{2} \times 10$ 15 $3\frac{1}{2} \times 24$ 84 $6\frac{1}{3} \times \$1.20$ \$7.60

13. $\frac{2}{3} \times 36$ 24 $\frac{2}{5} \times 15$ 6 $2\frac{1}{3} \times 18$ 42 $2\frac{3}{4} \times 32$ 88 $3\frac{1}{4} \times \$1.36$ \$4.42

14. $\frac{5}{6} \times 48$ 40 $\frac{7}{8} \times 96$ 84 $3\frac{5}{8} \times 24$ 87 $1\frac{5}{6} \times 42$ 77 $2\frac{3}{8} \times \$1.28$ \$3.04

15. $\frac{3}{5} \times 40$ 24 $\frac{2}{3} \times 81$ 54 $2\frac{2}{3} \times 21$ 56 $3\frac{1}{8} \times 16$ 50 $2\frac{1}{5} \times \$2.00$ \$4.40

More Practice. See ㊻ on page 325.

Use this review as diagnostic test of pupils' skills in common-fraction calculation. Group pupils who had errors and help them to analyze causes. Reteach or review further as needed.

Provide mixed review of addition, subtraction, multiplication, and division of whole numbers.

Review Practice

Find the answers. Watch the signs: Stress.

1. 629 + 756 1385 503 − 487 16 1875 ÷ 25 75 58 × 3007 174,406

2. 207 × 584 120,888 436 + 219 655 1273 ÷ 67 19 74 × 1753 129,722

3. 700 − 136 564 608 + 395 1003 1242 ÷ 46 27 12 × 6025 72,300

4. 450 × 936 421,200 650 − 175 475 6448 ÷ 13 496 93 × 4186 389,298

5. An airplane made a trip of 5225 mi. in 19 hr. of flying. What was its average speed in miles per hour? 275 mi.

6. A record shop sold 175 records at $2.98 each. How much did it get for these records? $521.50

Multiply and check your work:

7. 625	308	971	804	749	562
74	39	258	607	419	386
46,250	12,012	250,518	488,028	313,831	216,932
8. 265	719	830	197	348	254
95	63	482	197	165	283
25,175	45,297	400,060	38,809	57,420	71,882

9. A special bus took 45 children to the city during Easter vacation. They paid $38.25 to hire the bus for this trip. If the 45 children each paid an equal share, how much did each child pay? $.85

10. Mary can save $.75 a week. How many weeks will it take her to save $9.00? 12 to save $15.00? 20 $27.00? 36

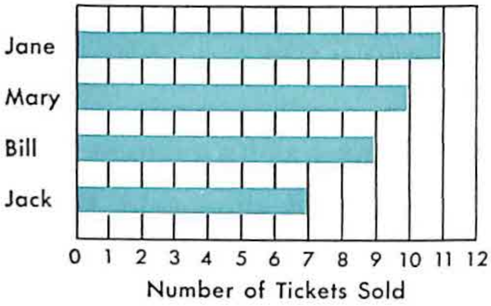
Divide and check. Use any remainder to give a fraction in the quotient: Stress.

11. $36\overline{)3047}$ $84\frac{23}{36}$	$24\overline{)4200}$ 175	$87\overline{)8352}$ 96	$18\overline{)3264}$ $181\frac{1}{3}$	$46\overline{)12190}$ 265
12. $21\overline{)2688}$ 128	$39\overline{)4266}$ $109\frac{5}{13}$	$67\overline{)2546}$ 38	$28\overline{)2361}$ $84\frac{9}{28}$	$24\overline{)12192}$ 508
13. $33\overline{)9245}$ $280\frac{5}{33}$	$64\overline{)6016}$ 94	$43\overline{)7482}$ 174	$35\overline{)3302}$ $94\frac{12}{35}$	$16\overline{)13600}$ 850
14. $55\overline{)9476}$ $172\frac{16}{55}$	$39\overline{)1794}$ 46	$25\overline{)2215}$ $88\frac{3}{5}$	$38\overline{)2774}$ 73	$29\overline{)21170}$ 730

Let different pupils explain their work at blackboard. Note class or individual weaknesses and plan for further review or reteaching.

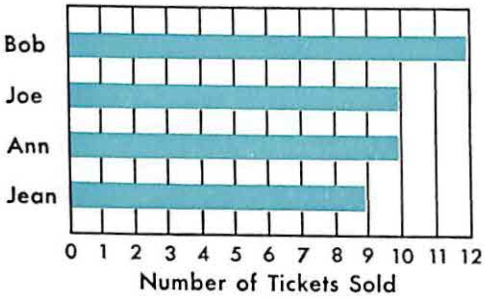
Learning about Bar Graphs

1. The Clearfield schools had a circus and all the pupils worked to sell tickets for it. Every member of Miss Black's class had 12 tickets to sell. The first week Jane and Mary sold the most tickets for the girls in the class. Bill and Jack sold the most tickets for the boys. To show this, Miss Black made a picture on the blackboard like the one at the right. This picture is a **bar graph.** It is used to compare the numbers of tickets sold by the four pupils. The graph quickly shows that Jane sold the most tickets. The numbers across the bottom are called the **scale.** These numbers run from 0 to 12. Each space on the scale stands for 1 ticket.



2. From the bar graph above tell how many tickets each one of the four pupils sold. Jane, 11; Mary, 10; Bill, 9; Jack, 7

3. Miss Hunt made a graph for her class like the one shown at the left. Who sold the most tickets the first week in Miss Hunt's room? Bob How many tickets did each of the 4 pupils sell? Bob, 12; Joe, 10; Ann, 10; Jean, 9



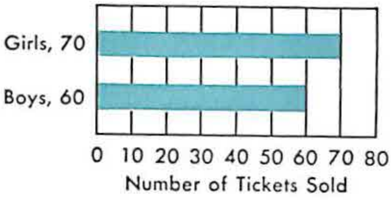
4. Make a bar graph like those above to show that in Miss West's room George sold 9 tickets, June sold 7 tickets, Mary sold 7, and Joe sold 4. See G-86.

5. Suppose each pupil had 20 tickets to sell and that four pupils sold these numbers of tickets: Henry, 18 tickets; Charles, 14 tickets; Virginia, 8; Polly, 7. Make a bar graph to show these facts. Let each space stand for 1 ticket. See G-86.

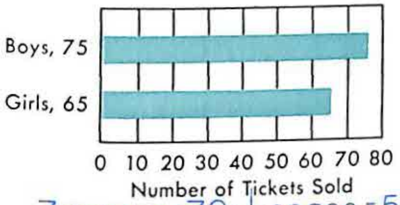
Follow development as given, emphasizing importance of title or label to tell what the graph shows and that scale spaces must be of uniform size.

More about Bar Graphs

1. Miss Black made another graph to show the sales in her room for the first week. All the girls together sold 70 tickets and all the boys together sold 60 tickets. In the graph at the right, which Miss Black made, you see that the numbers across the bottom, called the scale, run from 0 to 80. Each space on the scale stands for 10 tickets. Since the girls sold 70 tickets, the bar for the girls is 7 spaces in length. How many spaces long is the bar for 60? 6



2. The first week in Miss Hunt's room all the boys together sold 75 tickets and all the girls sold 65 tickets. On Miss Hunt's graph, which is shown at the left, each space stands for 10 tickets, so a half space stands for 5 tickets. To show 75, Miss Hunt made the bar $7\frac{1}{2}$ spaces long. You see that the end of the bar comes halfway between 70 and 80. Why? 7 spaces = 70, $\frac{1}{2}$ space = 5 How did she draw the bar for 65? $6\frac{1}{2}$ spaces long Tell where the bar would end on this graph if you wanted to show 55; Halfway between 50 and 60 if you wanted to show 35. Halfway between 30 and 40



3. In Miss West's room the first week all the boys sold 60 tickets and all the girls sold 45 tickets. Make a bar graph to show these facts. See G-86.

4. Suppose the boys in Miss West's room sold 58 tickets and the girls sold 62. Make a bar graph of these facts. See G-86.

▶ The bar for 58 will be a little less than 6 spaces. How long will the bar for 62 be? A little more than 6 spaces

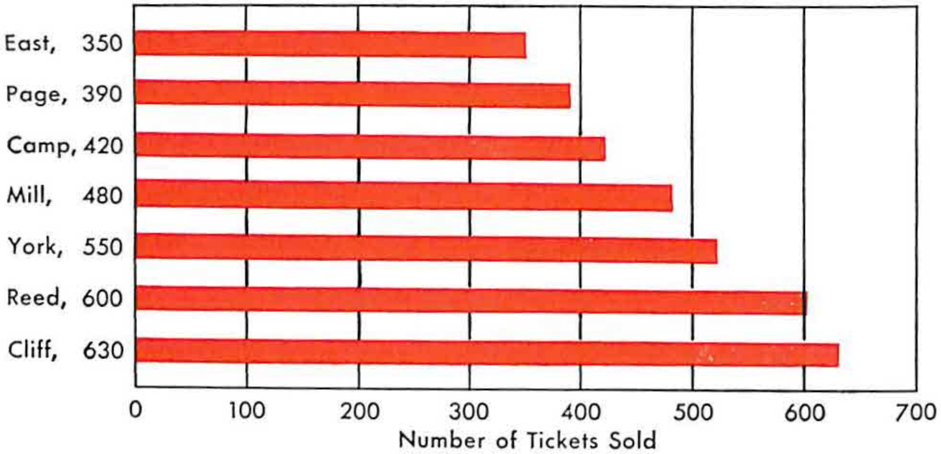
5. Draw bars to show these numbers of tickets: 30, 43, 55, 70, 78, 90. First draw the scale, letting each space stand for 10. Make each space on the scale $\frac{1}{4}$ in. wide. See G-87.

6. Suppose the girls in your room sold 92 tickets and the boys sold 88 tickets. Make a bar graph of these facts. See G-87.

Ask pupils why scale in ex. 1 is 1 space = 10 tickets and not 1 space = 1 ticket (as on page 244) to point out that scale selected depends on space available for graph and upon range in number values to be shown.

Reading and Drawing Graphs

1. Miss Black had the figures showing the number of tickets sold by each of the seven schools in Clearfield. She made the graph below to show how the seven schools compared in the ticket sale. You see that the bars in the graph are placed in order, beginning with the shortest one. How many tickets did each school sell?



2. Each space in the graph above stands for 100 tickets. To show that the East School sold 350 tickets, Miss Black drew the bar $3\frac{1}{2}$ spaces long. To show 390 tickets for the Page School, Miss Black made a bar just a little less than 4 spaces, but longer than $3\frac{1}{2}$ spaces. Study each of the other bars to see if it agrees in length with the number marked at the left end of the bar. One of the bars is not drawn the correct length. Which bar is it? The bar for York School

Draw bar graphs to show these facts. Let each space = $\frac{1}{2}$ in.:

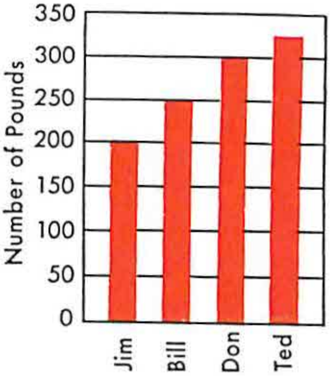
3. Four boys sell newspapers after school and on Saturday. Last week Jim sold 500 papers, Ted sold 450, Sam sold 300, and Joe sold 240. See G-87.

4. The numbers of pupils in six different schools are as follows: Brooks, 500; Hill, 450; Lake, 340; Maple, 310; Point, 290; Stone, 250. See G-87.

Discuss scale in ex. 1 as compared with those on pages 244-245 as to reasons for its selection. Point out that bar graphs are drawn primarily to make "quick" comparisons of numbers (even though numbers are shown).

Studying Scales on Graphs

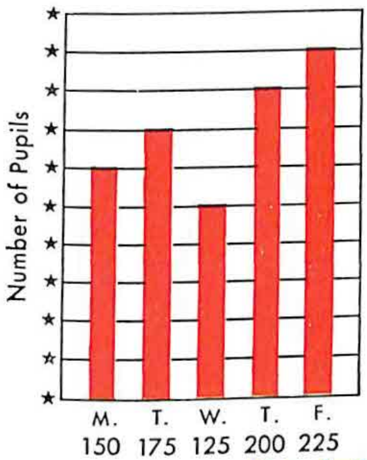
1. Bill made a bar graph like the one at the right to show the number of pounds of old paper collected by each of four boys. Bill did not write the number at the bottom of each bar that shows the number of pounds each boy collected; see the graph on page 246. Read Bill's graph and tell how many pounds of paper each boy collected. Jim, 200 lb.; Bill, 250 lb.; Don 300 lb.; Ted, 325 lb.



2. Study the scale on the graph in ex. 1. What number does each space on the scale stand for? 50 What number does half a space stand for? 25 If the end of a bar comes halfway between 100 and 150, what number does it stand for? 125 How would you draw a bar to show 175? By making the bar $3\frac{1}{2}$ spaces long

3. Make a bar graph like the one in ex. 1 to show that four other boys collected these numbers of pounds of paper: Peter, 125; George, 250; Henry, 275; Martin, 325. See G-88.

4. Jane made this graph to show the number of pupils that got books at the library last week. When she drew the graph, she forgot to write the numbers on the scale that shows the number of pupils. Study the graph and tell the numbers to put in place of the stars. 0, 25, 50, 75, 100, 125, 150, 175, 200, 225, 250



5. In the Hilltop School last week 50 pupils were out of school on Monday; 38 on Tuesday; 43 on Wednesday; 40 on Thursday; and 42 on Friday. Make a bar graph using these facts. See G-88. On the scale of your graph, will each space stand for 10 or for 50? 10

Explain meaning of horizontal and vertical and point out that graphs on this page are vertical ones, while others were horizontal. Have pupils bring in and discuss other bar graphs, cut from newspapers or magazines.

Oral Review

1. Multiply each number by 10;(1) by 20;(2) by 100:(3)

(1) 430 310 240 500 620 740 830 900
(2) 43 860 31 620 24 480 50 1000 62 1240 74 1480 83 1660 90 1800
(3) 4300 3100 2400 5000 6200 7400 8300 9000

2. Subtract 5 from each number;(1) subtract 9;(2) subtract 10:(3)

(1) 81 33 44 19 52 60 87 65
(2) 86 77 38 29 49 40 24 15 57 48 65 56 92 83 70 61
(3) 76 28 39 14 47 55 82 60

3. Add 8 to each number;(1) add 9;(2) add 10;(3) add 20:(4)

(1),(2) 23,24 29,30 68,69 47,48 62,63 84,85 56,57 31,32
(3) 15 25 21 31 60 70 39 49 54 64 76 86 48 58 23 33
(4) 35 41 80 59 74 96 68 43

4. Divide each number by 2;(1) by 4:(2)

(1) 124 220 80 100 42 $8\text{R}\frac{1}{2}$ $12\text{R}\frac{1}{2}$
(2) 248 62 440 110 160 40 200 50 84 21 17 $4\text{R}\frac{1}{4}$ 25 $6\text{R}\frac{1}{4}$

5. Change each fraction to a mixed number:

$\frac{7}{4}$ $1\frac{3}{4}$ $\frac{10}{3}$ $3\frac{1}{3}$ $\frac{13}{4}$ $3\frac{1}{4}$ $\frac{25}{6}$ $4\frac{1}{6}$ $\frac{20}{3}$ $6\frac{2}{3}$ $\frac{12}{5}$ $2\frac{2}{5}$ $\frac{15}{8}$ $1\frac{7}{8}$ $\frac{9}{6}$ $1\frac{1}{2}$ $\frac{30}{4}$ $7\frac{1}{2}$

6. Change each fraction to lowest terms:

$\frac{6}{8}$ $\frac{3}{4}$ $\frac{8}{10}$ $\frac{4}{5}$ $\frac{10}{16}$ $\frac{5}{8}$ $\frac{9}{12}$ $\frac{3}{4}$ $\frac{20}{30}$ $\frac{2}{3}$ $\frac{12}{15}$ $\frac{4}{5}$ $\frac{16}{20}$ $\frac{4}{5}$ $\frac{18}{24}$ $\frac{3}{4}$ $\frac{36}{45}$ $\frac{4}{5}$

7. Find the number of minutes from 7:42 A.M. to 25 8:07 A.M.

8. How many dozen eggs will 30 eggs make? $2\frac{1}{2}$

9. At 88¢ a yard, what will $\frac{3}{4}$ yd. of cloth cost? 66¢

10. At $6.00 a dozen, what will 6 handkerchiefs cost? $3.00

11. How many inches are there in 1 ft. 6 in.? 18

12. Read these numbers: CD 400, DCCLX 760, MCMLIX 1959, MCI 1101.

13. Count the change from $1.00 for each amount below:

56¢ 56,57,58,59,60,65,75,1 dollar
19¢ 19,20,25,50,1 dollar
83¢ 83,84,85,90,1 dollar
45¢ 45,50,1 dollar
60¢ 60,65,75,1 dollar
38¢ 38,39,40,50,1 dollar

14. A piece of cheese weighed 1 lb. 5 oz. How many ounces did it weigh? 21

Tell the number to put in each space:

15. $\frac{1}{2}$ hr. = 30 . min. $\frac{1}{4}$ lb. = 4 . . oz. $\frac{1}{2}$ yd. = 18 . . in.
16. 6 yd. = 18 . ft. $\frac{3}{4}$ hr. = 45 . min. 4 qt. = 8 . . pt.
17. 6 ft. = 2 . . yd. 2 bu. = 8 . . pk. 2 da. = 48 . . hr.

Conduct review as quiz program, letting different pupils act as quiz master. Note any class or individual weaknesses as pupils answer and plan remedial activities or further review.

Present magic squares with fractional rather than whole numbers.

Magic Squares

1. This figure is a magic square. Each column, each row, and each line from corner to corner has the same sum. For example, you see that $\frac{9}{16} + \frac{1}{8} + \frac{7}{16} = 1\frac{1}{8}$; $\frac{9}{16} + \frac{1}{4} + \frac{5}{16} = 1\frac{1}{8}$; $\frac{9}{16} + \frac{3}{8} + \frac{3}{16} = 1\frac{1}{8}$. There are 5 other sums in the square that are each equal to $1\frac{1}{8}$. Find the addends in each of these 5 sums and add them. Is each sum $1\frac{1}{8}$? Yes

1.

$\frac{9}{16}$	$\frac{1}{8}$	$\frac{7}{16}$
$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$
$\frac{5}{16}$	$\frac{5}{8}$	$\frac{3}{16}$

Emphasize. → When the numbers in a magic square are fractions, you must change the fractions to fractions having a common denominator before you can add them. Always change the sum to a mixed number. If there is a fraction in the sum, change it to lowest terms. Then you can tell whether the 8 sums in each square are all equal.

In each square below add the numbers in each row, in each column, and along each line from corner to corner. Do you get 8 equal sums in each square? If so, it is a magic square: All are magic squares.

2.

$\frac{1}{2}$	$\frac{13}{16}$	$\frac{3}{4}$
$\frac{15}{16}$	$\frac{11}{16}$	$\frac{7}{16}$
$\frac{5}{8}$	$\frac{9}{16}$	$\frac{7}{8}$

3.

$\frac{2}{5}$	$\frac{3}{10}$	$\frac{4}{5}$
$\frac{9}{10}$	$\frac{1}{2}$	$\frac{1}{10}$
$\frac{1}{5}$	$\frac{7}{10}$	$\frac{3}{5}$

4.

$\frac{1}{2}$	$\frac{7}{12}$	$\frac{1}{6}$
$\frac{1}{12}$	$\frac{5}{12}$	$\frac{3}{4}$
$\frac{2}{3}$	$\frac{1}{4}$	$\frac{1}{3}$

Sums: $2\frac{1}{16}$ $1\frac{1}{2}$ $1\frac{1}{4}$

5.

.88	.11	.66
.33	.55	.77
.44	.99	.22

6.

.37	.86	.51
.72	.58	.44
.65	.30	.79

7.

.86	.70	1.50
1.66	1.02	.38
.54	1.34	1.18

Sums: 1.65 1.74 3.06

This work is mainly for more advanced pupils, but let all try it, in particular ex. 5-7. Have better pupils see if squares are still magic after adding fraction or decimal

Have pupils who have difficulties with problems talk out their solutions to see if processes, thought patterns, and so on, are causes.

Review Problems

1. How much did Mrs. Brown pay for $2\frac{1}{4}$ lb. of meat at 48¢ a pound and a loaf of bread at 19¢? $1.27
2. Find the average weight of four girls whose weights are 63 lb., 75 lb., 67 lb., and 73 lb. $69\frac{1}{2}$ lb.
3. Three girls brought candy to the fifth grade food sale. Their candy weighed $2\frac{3}{16}$ lb., $3\frac{1}{8}$ lb., and $4\frac{1}{4}$ lb. How much candy did they bring all together? $9\frac{9}{16}$ lb.
4. Pencils were selling at 7¢ each. Mary bought a dozen for 75¢. How much did she save on a dozen pencils? 9¢
5. Mr. Chase averages about 36 mi. an hour in his car. How long will it take him to make a trip of 522 mi.? $14\frac{1}{2}$ hr.
6. John gets 60¢ an hour for delivering groceries after school. How much will he earn if he works $2\frac{1}{4}$ hr.? $1.35 if he works $3\frac{3}{4}$ hr.? $2.25 if he works 1 hr. and 15 min.? 75¢
7. Miss Black took her class to see a play. Tickets for the 32 children cost $16.00. Don went later and paid $.75. How much would Don have saved by going with the class? $.25
8. The Bicycle Club made a trip of 8.3 mi. last week and one of 15.5 mi. this week. This week's trip was how much longer than the trip last week? 7.2 mi.
9. Bill bought a box of tools for $12.96. He is paying for them in 4 equal weekly payments. He now has $2.60 toward his next payment. How much more does he need? $.64
10. Susan had $5\frac{1}{2}$ cups of sugar. Yesterday she used $1\frac{1}{2}$ cups for a cake and $2\frac{1}{4}$ cups for candy. Now she needs $1\frac{1}{4}$ cups for a pie. Has she enough sugar left for the pie? Yes, $1\frac{3}{4}$ cups

Present test of basic understandings.

Mixed Practice

Use the numbers 60 and 15 to answer ex. 1 to 8 below:

1. What is the difference between these numbers? 45

2. What is the product of these numbers? 900

3. What is twice the sum of these numbers? 150

4. What is $\frac{1}{5}$ of each number? 12,3 $\frac{2}{3}$ of each number? 40,10

5. What improper fraction can be made from these numbers? $\frac{60}{15}$

6. What proper fraction can be made from these numbers? $\frac{15}{60}$

7. What is the numerator of the fraction you wrote in ex. 6? 15 What is the denominator? 60

8. What is the quotient of these numbers if you use the smaller number as the divisor? 4

9. Find $\frac{2}{3}$ of each number: 24, 16 30, 20 45, 30 66, 44 150, 100 240. 160

10. Multiply each number by $2\frac{1}{2}$: 10, 25 18, 45 26, 65 32, 80 40. 100

11. Write in figures: two million, twenty-five thousand, nine hundred three; 2,025,903 eight and seven tenths; 8.7 fifteen hundredths. .15

12. Divide each one by 25: 1325 53 1859 74R9 2025 81

13. Multiply each one by 476: 906 431,256 278 132,328 415 197,540 793 377,468

14. Add 1927 to each one: 2968 4895 4073 6000 7815 9742 3969 5896

15. Subtract 3896 from each: 6649 2753 9274 5378 8000 4104

16. Find the cost of 35 bicycles at \$37.95 each. \$1328.25

17. Find the cost of 1 book if 72 books cost \$142.56. \$1.98

18. Find the difference between \$200.00 and \$87.75. \$112.25

19. Find the sum: 6.3 mi. + 7.8 mi. + 4.5 mi. 18.6 mi.

20. Add these mixed numbers: $3\frac{7}{8}$, $2\frac{5}{8}$, $4\frac{1}{8}$. $10\frac{5}{8}$

21. How much more is $6\frac{1}{4}$ yd. than $2\frac{7}{8}$ yd.? $3\frac{3}{8}$ yd.

22. Write each one as a decimal: $\frac{85}{100}$, .85 $\frac{37}{100}$, .37 $\frac{9}{100}$, .09 $\frac{3}{10}$, .3 $\frac{7}{10}$. .7

After correcting papers and analyzing errors, group pupils who had errors to help them determine causes. Use developmental material found on pages related to pupils' difficulties for reteaching or further review.

Estimating Answers

At the end of each problem there are three numbers. Choose the number you think is nearest to the right answer. Then work the problem and compare your answer with the number chosen:

1. Bill's father bought him a pair of shoes for \$6.95 and socks for \$1.95. How much change should he get from \$10.00? ([✓ \$1.00], \$1.50, \$2.00) \$1.10

2. An airplane traveled 885 mi. in 3 hr. What was its average speed? (400 mi. per hour, 350 mi. per hour, [✓ 300] mi. per hour) 295 mi.

3. The Castle School bought 206 books at \$1.95 each. How much did all the books cost? (\$300, \$375, [✓ \$400]) \$401.70

4. At the store Ann spent \$.96, \$1.05, \$1.95, and \$2.10. How much money in all did she spend? (\$4.00, [✓ \$6.00], \$8.00) \$6.06

5. Mr. Hunt looked at two television sets. One cost \$199.50 and the other cost \$249.10. What was the difference in the prices of these sets? (\$100, [✓ \$50], \$30) \$49.60

6. Mrs. Wells bought 6 yd. of cloth at \$2.95 a yard. How much in all did the cloth cost? ([✓ \$18.00], \$16.00, \$12.95) \$17.70

Pupils who have difficulty with ex. 1-6 should be given further practice in rounding off numbers.

Do You Know These Words?

Show that you know what each word means by using it in a sentence or by giving an example of it:

7. ton
8. inch
9. sum
10. peck
11. twice
12. check
13. graph
14. factor
15. average
16. estimate
17. decimal
18. dividend
19. numerator
20. remainder
21. hundredths

Help pupils who need further review of vocabulary to make own study cards for these words. Let other pupils work at arithmetic corner on magic squares, original problems, and so on.

Present timed tests on fundamental operations.

Testing Your Skill

Addition Test

Add. Write the answers on folded paper: Time: 5 min.

1.	23869	30646	59974	65552
	8705	12573	4338	669
	44017	73417	5592	7658
	24342	8638	41656	23323
	100,933	125,274	111,560	97,202
2.	33088	22683	13436	71872
	99822	940	19766	15157
	17157	11054	82301	642
	49863	3102	58240	1524
	71324	13557	46269	55244
	271,254	51,336	220,012	144,439

Subtraction Test

Subtract. Write the answers on folded paper: Time: 4 min.

3.	45234	55521	16464	60000
	25498	18436	15569	49355
	19,736	37,085	895	10,645
4.	30005	94296	37090	81240
	24177	14437	17002	79996
	5828	79,859	20,088	1244
5.	53807	30000	69924	54192
	25933	18624	62956	23283
	27,874	11,376	6968	30,909

Multiplication Test

Copy and multiply: Time: 4 min. after copying.

6.	675	803	928	1735	4063
	614	803	670	57	29
	414,450	644,809	621,760	98,895	117,827

Division Test

Copy and divide: Time: 8 min. after copying.

	636	495	697	750 R3
7.	$23\overline{)14628}$	$64\overline{)31680}$	$16\overline{)11152}$	$25\overline{)18753}$
	482 R15	609	275 R11	813
8.	$52\overline{)25079}$	$37\overline{)22533}$	$48\overline{)13211}$	$29\overline{)23577}$

These tests should not be given at same time; space them about a week apart. Try to determine causes of hesitation or errors (basic facts, carrying, regrouping, and so on) and give further practice or reteach accordingly.

See G-89 for correlation of examples with aims.

Chapter Review

Read these numbers:

Two and five tenths Twenty-one and no tenths Five and nine hundredths

1. 2.5 11.6 21.0 0.7 5.09 16.30

Eleven and six tenths Seven tenths Sixteen and thirty hundredths

Write each number as a decimal or a mixed decimal:

2. $\frac{7}{10}$ .7 $\frac{39}{100}$ .39 $\frac{9}{100}$ .09 $7\frac{9}{10}$ 7.9 $8\frac{31}{100}$ 8.31 $4\frac{7}{100}$ 4.07

Write each number as a common fraction or a mixed number:

3. 0.6 $\frac{6}{10}$ 15.3 $15\frac{3}{10}$ .63 $\frac{63}{100}$ 4.19 $4\frac{19}{100}$ 1.04 $1\frac{4}{100}$ 5.07 $5\frac{7}{100}$

Write in columns, add, and check:

4. 17.8 + 21.6 + 15.9 55.3 2.65 + 5.38 + 2.92 10.95

5. 24.5 + 11.0 + 18.7 54.2 5.36 + 2.64 + 6.53 14.53

6. Subtract .47 from .71; .24 45.9 from 82.6; 36.7 24.5 from 74.0. 49.5

7. The school scales weigh in tenths of a pound. Today Mary weighed 81.6 lb. and Susan weighed 83.2 lb. How many pounds less than Susan does Mary weigh? 1.6

8. Last year the rainfall in Johnstown was 8.4 in. in April and 5.7 in. in May. How many inches of rain fell in Johnstown in those two months? 14.1

9. When Mr. Wood bought a used car the speedometer read 4287.6 mi. At the end of a year the speedometer read 9824.9 mi. How many miles had the car gone in that year? 5537.3

10. Fairfield and Green Lake are two towns on the same railroad line west of Jackson. It is 78.2 mi. from Jackson to Fairfield and 100.5 mi. from Jackson to Green Lake. How far is it from Fairfield to Green Lake? 22.3 mi.

11. In December 3.4 in. of snow fell in Englishtown. In January 6.8 in. fell there. How many inches of snow fell in the two months? 10.2

12. This week Dick rode his new bicycle every day after school. He rode these distances: 5.4 mi., 2.5 mi., 4.0 mi., 7.2 mi., 5.5 mi. How far did he ride in all after school? 24.6 mi.

Check each pupil's paper carefully to determine kinds of errors made. Let volunteers put examples on board so that pupils may discover reasons for their errors and discuss them. Plan for remedial activities.

A Problem Test

1. Jack weighed 78.5 lb. last December. Now he weighs 83.2 lb. How many pounds has Jack gained? 4.7

2. Ann worked for Mrs. Smith $2\frac{1}{2}$ hr. and earned \$.60 an hour. How much did Mrs. Smith pay Ann? \$1.50

3. The cooking class served 24 lunches at a cost of \$6.84. What was the average cost per lunch? $28\frac{1}{2}$¢

4. To reach camp Andy walked from 8:35 A.M. to 9:25 A.M. How many minutes did Andy walk to get to camp? 50

5. Don makes 75¢ on each birdhouse he sells. He wants to make \$13.50. How many birdhouses must he sell? 18

6. Mr. Hill sold Mrs. Brown $2\frac{1}{2}$ doz. eggs at \$.62 a dozen and a chicken weighing $3\frac{3}{4}$ lb. at \$.52 a pound. How much did Mrs. Brown pay Mr. Hill for these things? \$ 3.50

7. Mrs. Walker needs $2\frac{3}{8}$ yd. of wool cloth for Jean's coat, $\frac{1}{2}$ yd. for her hat, and $1\frac{3}{4}$ yd. for her skirt. How many yards of wool cloth in all does Mrs. Walker need? $4\frac{5}{8}$

8. Saturday Bill rode his bicycle 6.5 mi. to Indian Lake, 4.8 mi. to Newtown, and 4.4 mi. to get home. How many miles all together did Bill ride? 15.7

9. Susan took Mary and Betty to the movies. After buying 3 movie tickets at \$.44 each, Susan had \$.43 left. How much money did she have before buying the movie tickets? \$1.75

10. One train leaves Greenfield at 8:53 A.M. and reaches Valley Falls at 1:17 P.M. Another train leaves Greenfield at 5:10 P.M. and reaches Valley Falls at 9:09 P.M. What is the difference in time for the two train trips? 25 min.

Look below to find out what your score means.

SCORE	0–5 You need help	6–7 Fair	8–9 Good	10 Excellent

After pupils finish work check papers and analyze pupils' errors. If errors were computational, provide practice in this area. Discuss the problems with pupils who had errors to discover reasons for their mistakes.

Present diagnostic test on decimals, with page references.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Pages for that row.

Add and check:

						Practice Pages
1.	3.5 4.2 1.3 2.6	13.4 4.6 5.8 14.3	35.2 18.7 75.4 23.5	38.5 75.6 46.8 61.8	26.7 93.6 84.3 98.7	237
	11.6	38.1	152.8	222.7	303.3	
2.	.49 .47 .72 .05	.75 1.06 .69 .35	4.63 2.95 8.88 4.37	1.49 6.73 5.65 1.78	5.11 1.20 7.99 6.77	236, 237
	1.73	2.85	20.83	15.65	21.07	

Subtract and check:

3.	8.2 4.7	20.0 9.5	40.4 38.6	90.8 73.3	86.5 43.9	230, 233
	3.5	10.5	1.8	17.5	42.6	
4.	.84 .57	9.33 6.85	6.08 4.18	5.25 2.48	7.00 3.46	236, 237
	.27	2.48	1.90	2.77	3.54	

Write in figures:

5. Three hundred fourteen and seven tenths 314.7 — 228

6. Five hundred six and eleven hundredths 506.11 — 228

7. Forty-seven and eight hundredths 47.08 — 228

Write each as a common fraction or a mixed number:

8.	.9 $\frac{9}{10}$	0.3 $\frac{3}{10}$	1.7 $1\frac{7}{10}$	11.5 $11\frac{5}{10}$	8.1 $8\frac{1}{10}$	228
9.	.33 $\frac{33}{100}$	.07 $\frac{7}{100}$	2.19 $2\frac{19}{100}$	1.47 $1\frac{47}{100}$	3.03 $3\frac{3}{100}$	228

Write each as a decimal or a mixed decimal:

10.	$\frac{3}{10}$ .3	$\frac{9}{10}$ .9	$1\frac{7}{10}$ 1.7	$2\frac{5}{10}$ 2.5	$4\frac{1}{10}$ 4.1	228
11.	$\frac{7}{100}$ .07	$\frac{19}{100}$ .19	$2\frac{3}{100}$ 2.03	$4\frac{23}{50}$ 4.46	$2\frac{19}{25}$ 2.76	228, 229

Confer with pupils who had errors to determine causes from their explanations. Have them do computations aloud to check thinking. Urge pupils to make self-assignments from practice pages. Let other pupils work on magic squares.

See G-91 for specific aims of Chapter 8.

Chapter 8

Present mixed problems dealing with Grand Canyon (pages 257-259).

The Grand Canyon

1. The Grand Canyon of the Colorado, one of the greatest wonders of the world, lies in northern Arizona. This canyon was formed during many thousands of years by the Colorado River cutting a bed for itself through the rocks. The canyon is 217 mi. long and from 4 mi. to 18 mi. wide at the rim. What is the average width of the Grand Canyon? 11 mi.

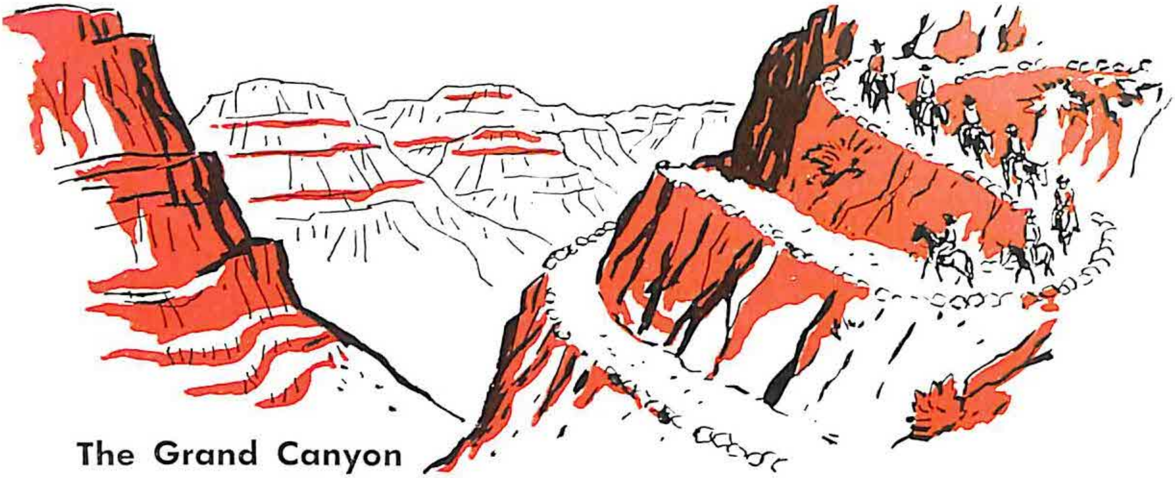
2. You can stand on the rim of the canyon and see the Colorado River about a mile below. The North Rim of the canyon is 5500 ft. above the river, while the South Rim is 4400 ft. above it. The North Rim is how much farther above the river than the South Rim? 1100 ft.

3. It is known from tree rings that Indians lived here and cut trees for their houses as early as 1064. About how many centuries ago was that? About 9

4. A well-known explorer of the Grand Canyon was Major John W. Powell. In 1869 he and five other men spent 3 mo. exploring it. How long ago was that?

5. In one year there were 814,130 visitors to the Grand Canyon. Is that about $\frac{1}{2}$, $\frac{3}{4}$, or $\frac{4}{5}$ million people? About $\frac{4}{5}$

Do problems on these pages orally with pupils. Let different ones read problem, another write it in numerical form on board, then have class solve problem. Point out to pupils that facts used are authentic.



The Grand Canyon

1. One of the most interesting things to do at Grand Canyon is to go to Phantom Ranch at the bottom of the canyon. The only way to go down is to ride a mule down the narrow trail along the canyon wall. The distance from the South Rim to Phantom Ranch is 7.8 mi. How far is the trip down to Phantom Ranch and back? 15.6 mi.

2. The air distance from the South Rim to the North Rim is about 10 mi. To go from the South Rim to the North Rim along the trail by way of Phantom Ranch is 28 mi. About how many times as far as the air distance is the trail trip? About 3

3. All oil for lighting, cooking, heating, and freezing food must be carried to the Ranch by mule train. The Ranch uses 2 tons of oil a month. How many pounds of oil is that per day? $133\frac{1}{3}$ Count 30 days to a month.

4. During the busy summer months Phantom Ranch uses 3500 lb. of supplies each week in addition to the oil. How many pounds of other supplies is that per day? 500 How many pounds of oil and other supplies are used a day in summer? $633\frac{1}{3}$ See ex. 3.

5. The temperature at Phantom Ranch is about 20° higher than it is on the South Rim. When it is 63° on the rim, about how warm is it at Phantom Ranch? 83° When it is 95° at Phantom Ranch, about what is the temperature on the South Rim? 75°

Encourage pupils who have visited Grand Canyon to tell of their experiences and impressions.

6. About halfway down the canyon wall is a wide space known as Indian Gardens. There are springs of water here which supply all the water for the Park. Indian Gardens is about $\frac{3}{5}$ mi. below the rim. How many feet must the water be pumped up? 3168

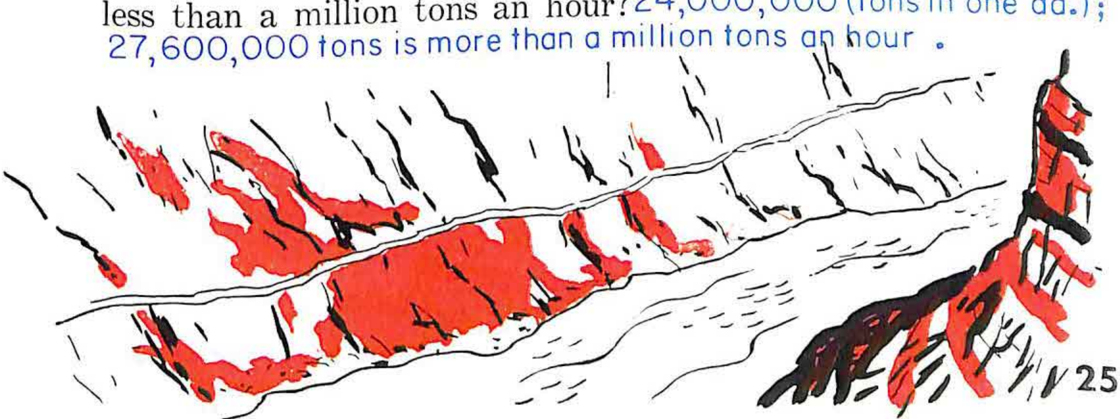
7. Explorers have found the ruins of about 600 Indian villages in the canyon. If you could visit one of these ruins each day, about how many weeks would you need to visit all of them? About 86

8. The Navajo Indians live near the Park. In 1867 there were about 7000 of them; in 1955 there were about 50,000. How many years is it from 1867 to 1955? 88 How many more Indians were there in 1955 than in 1867? 43,000 The tribe grew by about how many Indians each year? Give your answer to the nearest hundred Indians. 500

9. All animals and plants are protected in the Park. Many of the animals are very tame. The pronghorn deer is found there. It is one of the fastest animals in our country. One deer in the Park was timed at 45 mi. per hour. How many minutes would it take that deer to run a mile? $1\frac{1}{3}$

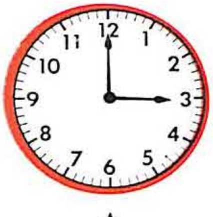
10. In the summer visitors can hear talks about the wild life in the Park. One summer 79,974 visitors to the South Rim heard such talks. Is that about $\frac{1}{8}$, $\frac{1}{9}$, or $\frac{1}{10}$ of the 814,130 people who visited the Park that year? About $\frac{1}{10}$

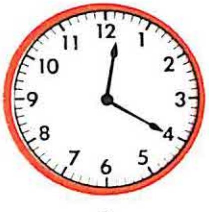
11. The United States government estimates that the amount of soil carried down the Colorado River averages $\frac{1}{2}$ million tons a day. Write that number another way and then read it. 500,000 tons In 1927 during a flood, 27,600,000 tons of soil passed a given point in 24 hr. Read that number. Is that more or less than a million tons an hour? 24,000,000 (tons in one da.); 27,600,000 tons is more than a million tons an hour.



Teach or reteach meaning of angle, right angle, square, rectangle. Emphasize fact that square is special rectangle with four equal sides.

Squares and Rectangles


A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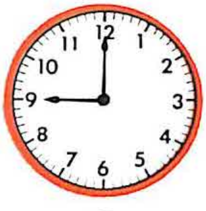
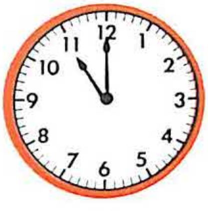
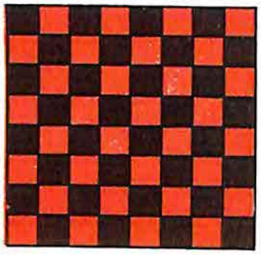

C


D

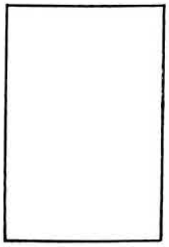
1. When two lines like the hands of a clock meet in a point they form an **angle.** An angle that is like the corner of a book or a sheet of paper is called a **right angle.** In which of the clocks above do the hands form a right angle? A and C

Use corners of classroom to illustrate right angle also.



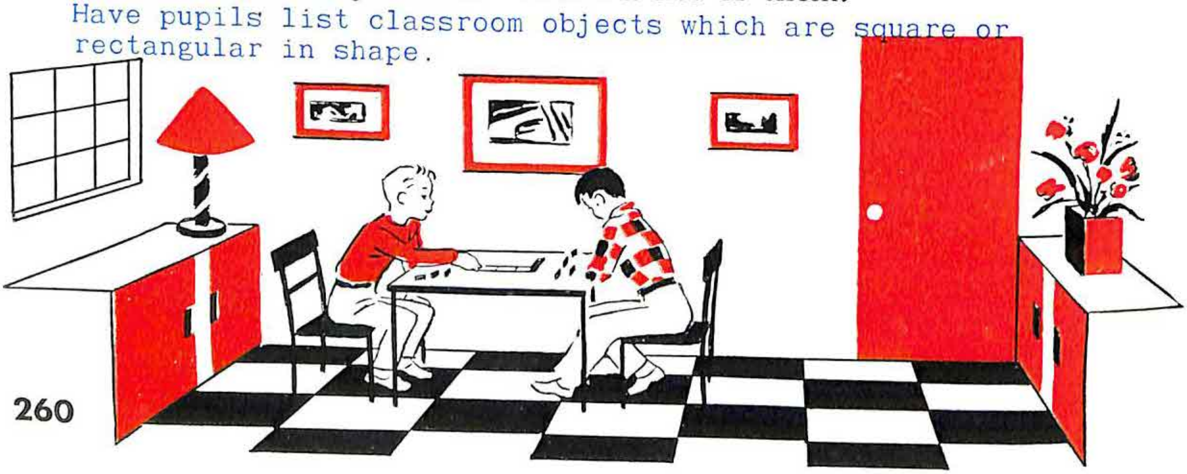
2. When you play checkers, you use a board that has square corners, or right angles, and is the same length on all its four sides. Such a figure is called a **square.** A checkerboard is divided into small squares. How many black squares are there? How many red squares are there? 32

3. A figure like the schoolroom door is called a **rectangle.** It has 4 sides and 4 square corners, or right angles. Are any of its sides equal? Yes, the top and the bottom and the two sides How many rectangles can you find in your schoolroom? How many squares? Does a square have 4 sides and 4 right angles? Yes Is a square a rectangle? Yes


Rectangle

4. Look at the picture below and find as many squares and rectangles as you can. Make a list of them.

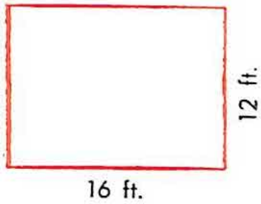
Have pupils list classroom objects which are square or rectangular in shape.



Teach how to compute perimeter (pages 261-262). Relate perimeter to objects in class (desks, books, classroom itself), and extend to section of school yard.

Fred and His Pets

1. Problem Fred's uncle gave him some chickens. Fred built a chicken yard shaped like a rectangle. It is 12 ft. wide and 16 ft. long. Do you know how much wire netting he needed for the chicken yard? 56 ft.



Explanation To find the number of feet of wire Fred needed for the chicken yard, you must find the distance around the yard, which is 12 ft. + 16 ft. + 12 ft. + 16 ft., or 56 ft. in all. So 56 ft. of wire netting were needed.

The distance around a rectangle is called its **perimeter.** The perimeter of Fred's chicken yard is 56 ft. Add new word to class vocabulary chart.

2. Fred also built a runway for his two dogs. This runway is 8 ft. wide and 25 ft. long. How many feet of wire netting did Fred use to make the fence around the runway for the two dogs? 66

3. Fred has a little calf. It is in a small field by itself. Fred's father built a fence around the field. It is 42 ft. wide and 56 ft. long. How many feet of fence did Fred's father need for this field? 196

4. Fred's father has a garden 40 ft. by 60 ft. What is the perimeter of his garden? 200 ft.

Emphasize that perimeter is distance and can be measured by ruler, yardstick, or tape measure. Have pupils draw labeled picture for each problem: see G-92.

More about Perimeters

1. A baseball field is a square that is 90 ft. on a side. How far must a player run when he makes a home run? 360 ft.

2. The fifth grade boys play baseball on a field that is 60 ft. on a side. How far does a fifth grade player run when he makes a home run? 240 ft.

3. Jane and Betty are making table mats for their mother's birthday. Each mat is a rectangle 12 in. by 18 in. They want to put edging on the mats. If they allow 3 extra inches on each mat for turning corners and finishing, how much edging will they need for 1 mat? 63 in.

4. Jane and Betty are making napkins to match the mats. Each napkin is a square 15 in. on a side. They allow 3 extra inches on each napkin. How much edging do they need for each napkin? 63 in.

5. If the girls make 6 mats and 6 napkins, how many yards of edging will they need to buy? 21 How much will it cost at 15¢ a yard? $3.15 See ex. 3 and 4.

6. Joe built a pen for his rabbits. It was 12 ft. long and 6 ft. wide. How many feet of wire did he need for the pen? 36

7. Mr. Lane had a new fence put around a field which is 236 ft. by 425 ft. How many feet of fence did he need to go around the field? 1322

8. Mr. Lane walked around his field to examine the new fence. Did he walk about 1 mi., $\frac{1}{2}$ mi., or $\frac{1}{4}$ mi.? About $\frac{1}{4}$ mi. See the answer to ex. 7.

Find the perimeter of each rectangle:

9. 20 ft. by 32 ft. 104 ft. 17.5 in. by 24.3 in. 83.6 in. 6 yd. by 9 yd. 30 yd.

10. 52 yd. by 52 yd. 208 yd. .87 mi. by 1.32 mi. 43.8 mi. 8 ft. by 3 yd. 34 ft.

11. 30 in. by 48 in. 156 in. 12.5 ft. by 15.6 ft. 56.2 ft. 4 ft. by 2 yd. 20 ft.

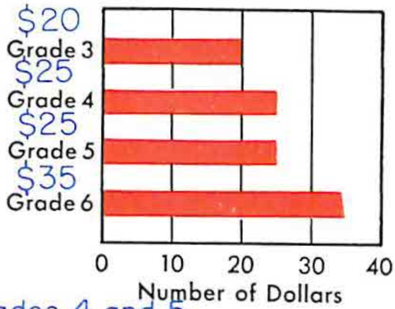
More Practice. See ㊼ on page 326.

Some pupils may see that perimeter of square may be found by multiplying dimension by 4. Emphasize again that perimeter is distance around "all" sides, not merely sum of length and width. Have pupils find perimeters of classroom objects.

Review bar graphs and present problems involving mixed operations.

Planning Gift Boxes

1. Four grades in the Lake School have earned money for boxes to send to children in other lands. When they had all the money together, Miss Black made the graph at the right to show how much each grade earned. In this graph the numbers on the scale stand for dollars. See graph. How much money did each grade earn? Which grade earned the most money? Grade 6 Did any two grades earn the same amount? Grades 4 and 5 Does the graph show how much the pupils earned all together? How much in all did the four grades earn? $105



2. The children want to pack 35 boxes. If they have $105, what is the average amount they can spend per box? $3

3. Some children think they should spend $5 per box. How many boxes at $5 each could they pack for $105? 21

4. Miss Black suggested that they should put a toy, socks or stockings, handkerchiefs, soap, hard candy, and a book in each box. The prices of these things were $.75, $.50, $.70, $.20, $.45, $.25. How much in all was that for each box? $2.85 Do you think the children have enough money to pack 35 boxes? $99.75, yes

5. Find out how much the things in ex. 4 would cost in the town where you live. Can you buy them for $3 or less?

Discuss ex. 1 with pupils. Let them complete others independently.

Provide review of measures.

Using Measures

Tell the number that goes in each space:

1. $2\frac{1}{2}$ lb. = 40 oz. 20 pk. = 5 bu. $\frac{1}{2}$ min. = 30 sec.

2. $1\frac{1}{4}$ yd. = 45 in. 24 hr. = 1 da. $\frac{1}{4}$ hr. = 15 min.

3. $1\frac{1}{2}$ qt. = 3 pt. 15 ft. = 5 yd. 6 mo. = $\frac{1}{2}$ yr.

4. $1\frac{1}{2}$ hr. = 90 min. 16 qt. = 2 pk. 9 in. = $\frac{1}{4}$ yd.

5. $1\frac{1}{2}$ ft. = 18 in. 16 oz. = 1 lb. 8 oz. = $\frac{1}{2}$ lb.

6. $1\frac{1}{4}$ bu. = 5 pk. 20 qt. = 5 gal. 6 in. = $\frac{1}{2}$ ft.

7. Mrs. Wood bought 20 oz. of cheese at $.60 a pound. How much did she pay for the cheese? $.75

8. Which candy bar costs more per ounce, a 2-ounce bar for 5¢ $2\frac{1}{2}$ ¢ or a 6-ounce bar for 17¢? $2\frac{5}{6}$ ¢; 6 oz. bar costs $\frac{1}{3}$ ¢ more.

9. Name three months that have 31 days, two months that have 30 days, and one that has 28 days.

10. How many days are there in a leap year? 366 Is this year a leap year? Name the next two leap years.

11. How many years are there in a century? 100 Can you tell in which century you are living? 20th

12. Mr. Hunt can carry a 5-ton load in his truck. Can he carry 28 boxes each weighing 350 lb.? Yes, with 200 lb. to spare

13. How many boxes each weighing 50 lb. can Mr. Hunt carry on his truck? 200 See ex. 12.

14. This week Bill practiced his music lesson 50 min., 30 min., 35 min., 45 min., 40 min., and 70 min. How many hours all together did Bill practice this week? $4\frac{1}{2}$

15. On the school playground there is a running track. It is 880 ft. around the track. Don ran around the track 6 times this afternoon. Did Don run as much as a mile? Yes, exactly

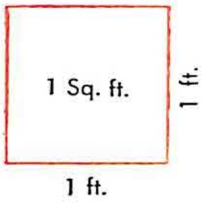
16. Give the name of a measure that is found in two different tables of measure. The pint or quart in liquid measure and dry measure

Do ex. 1-6 orally, letting different pupils act as the teacher. Urge pupils to complete as many other problems as they can mentally. Group pupils for further review if needed.

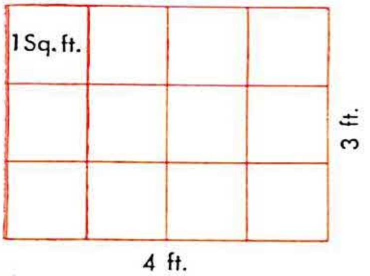
Introduce meaning of area, applied to squares and rectangles.

What Is Area?

1. Mr. King bought some grass seed. The directions said 1 pound was enough for 250 square feet. Bob wanted to know what 250 square feet meant. Mr. King explained that Emphasize. → a **square foot** is the name given to the surface, or **area**, covered by a square that is 1 foot on a side. One pound of grass seed is enough for an area 250 times as large as 1 square foot. A picture of a square foot is shown at the right. Draw a square foot on the blackboard. The abbreviation for 1 square foot is 1 sq. ft.

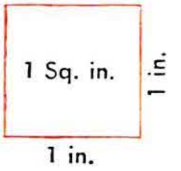


2. Don built a house for his dog. He made the floor 3 ft. wide and 4 ft. long. When his father asked how many square feet of floor space the dog had, Don drew a picture like the one at the right. How many square feet were there? 12

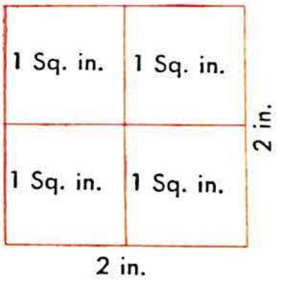


Have pupils count number of square feet.

3. For measuring small areas like the area of a page in this book or the area of a pan of candy, you need a smaller unit of measure. Just as a square foot is the area covered by a square that is 1 ft. on a side, a **square inch** is the area covered by a square that is 1 in. on a side.



4. Draw and cut out a square that has each side 2 in. long. Fold it, as shown at the right. How many square inches are there in this square? 4 This shows that the area of this square is 4 square inches, or 4 sq. in.



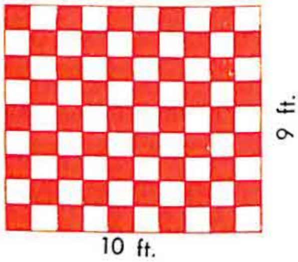
5. Cut a square of paper 4 in. on a side. Fold it four times so that it is divided into square inches. How many square inches are there in its area? 16

Have pupils draw and cut out a square foot. Draw rectangle (6 feet by 5 feet) on board and let pupils place their foot squares on it, until covered. Have pupils count number of square feet. Follow similar procedure for square inches.

Teach how to find areas of rectangles in terms of square feet, square yards, square miles (pages 266-268).

Linoleum for the Kitchen Floor

1. **Problem** Mrs. Chase needed linoleum for her kitchen floor. The floor is 10 ft. long and 9 ft. wide. How many square feet of linoleum did Mrs. Chase need to buy to cover her kitchen floor? 90



Explanation The picture at the right shows the whole kitchen floor; it has the shape of a rectangle. Each small square stands for 1 sq. ft. You can find the area of the floor by counting the small squares. How many square feet are there in the floor? 90

A shorter way to find the area of the floor is like this: You see that there are 10 sq. ft. in the top row of the rectangle and that there are 9 rows like this. So the area is 9 × 10 sq. ft., or 90 sq. ft. You see you found the area by multiplying the length, 10, by the width, 9. Mrs. Chase needed 90 sq. ft. of linoleum for the floor.

2. Mrs. White has a kitchen 12 ft. long and 9 ft. wide. How many square feet of linoleum will it take to cover the floor? 108
▶ Make a picture of the floor like that for ex. 1. How many square feet are there in 1 row? 12 How many rows are there? 9

In doing work on page 265, some pupils may have discovered generalization in ex. 1 above. Give pupils opportunity to find area (in sq. ft.) of marked off spaces on classroom floor. Have them check answers by using their foot squares.

Introduce rule and develop formula for finding area of rectangle.

Measuring Areas

1. Don's father made a game room 10 ft. wide and 12 ft. long. How many square feet are there in the floor of this room? 120

2. In ex. 1 the length and width of the room are both given in **feet** and the area is found in **square feet.** In finding the area of a rectangle, both the length and the width must be given in the same unit of measure.

To find the area of a rectangle, multiply its length by its width.

3. If you let **A** stand for **area**, **l** for **length**, and **w** for **width**, you can write the rule in ex. 2 as a **formula**:

$$A = l \times w$$

Since multiplication signs are usually omitted in formulas, this formula can also be written:

$$A = lw$$

Remember that **lw** means **l** × **w**. Emphasize.

4. Betty's room is 11 ft. by 13 ft. Find the area of the floor. 143 sq. ft.

5. John's garden is 6 ft. by 8 ft. (48 sq. ft.) Bill's is 5 ft. by 10 ft. (50 sq. ft) Which garden has the larger area? Bill's How much larger is it? 2 sq. ft.

6. Mr. Jackson wants to paint the kitchen floor. It measures 12 ft. by 14 ft. How many square feet are there in the kitchen floor? 168 A quart of paint will cover 180 sq. ft. Is 1 qt. of paint enough? Yes

Find the areas of these rectangles:

7. 4 ft. by 6 ft. 24 sq. ft. 10 ft. by 13 ft. 130 sq. ft. 12 ft. by 19 ft. 228 sq. ft.

8. 6 ft. by 8 ft. 48 sq. ft. 12 ft. by 15 ft. 180 sq. ft. 21 ft. by 24 ft. 504 sq. ft.

More Practice. See ㊽ on page 326.

Emphasize fact that both length and width of rectangle must be in same unit and that area is in square feet when dimensions are in feet, square inches when in inches.

Measuring Areas

1. A square that measures 1 yd. on each side is called a **square yard.** The square yard is used in measuring areas, just as the square foot and the square inch are used in measuring areas.

2. Draw a square yard on the blackboard. You see the square yard is a large unit of measure. The square yard is often used to measure the area of a sidewalk or a floor.

3. Mrs. White's kitchen is 4 yd. wide and 5 yd. long. At $1.95 per square yard, how much will it cost to cover the floor with linoleum? $39.00

▶ The length and width of the floor are both given in yards. Then the area will be found in square yards. How many square yards are there in the area? 20 Find the cost of the linoleum at $1.95 per square yard.

4. The men are laying a cement sidewalk in front of Mr. Hunt's new house. The walk is 1 yd. wide and 36 yd. long. How much will it cost to lay this walk at $2.50 per square yard? $90.00 at $3.75 per square yard? $135.00

5. At $1.85 a square yard, what will the linoleum cost for a room 6 yd. by 8 yd.? $88.80 Another way to write 6 yd. by 8 yd. is 6 yd. × 8 yd. The sign × means "by." Emphasize.

6. Very large areas, such as the area of the United States, or the area of a state, are measured in square miles. A square mile is a square measuring 1 mi. on each side. The area of Yellowstone Park is about 3458 sq. mi. The area of Grand Canyon Park is about 1008 sq. mi. Is Yellowstone Park about 2 or 3 times as large as Grand Canyon Park? About 3

In ex. 7–9 be sure pupils express areas in sq. ft., sq. yd., or sq. mi., depending on dimensions.

Find the areas of these rectangles:

7. 4 yd. by 5 yd. 20 sq. yd. 11 yd. × 16 yd. 176 sq. yd. $3\frac{1}{2}$ ft. × 6 ft. 21 sq. ft.

8. 7 yd. by 8 yd. 56 sq. yd. 12 yd. × 17 yd. 204 sq. yd. $4\frac{1}{2}$ ft. × 8 ft. 36 sq. ft.

9. 8 yd. by 8 yd. 64 sq. yd. 16 yd. × 16 yd. 256 sq. yd. $6\frac{1}{4}$ mi. × 12 mi. 75 sq. mi.

Draw square yard on blackboard. Let pupils compare their foot squares with it to contrast size and informally discover how many square feet are needed to cover it. Do ex. 1–6 with pupils. Let them complete ex. 7–9 independently.

Teach meaning and use of signs ' and ". Present work on finding both perimeters and areas.

Perimeters and Areas

1. Find the perimeter of a rectangle 4 ft. wide and 7 ft. long; 22 ft. of a rectangle 6 in. wide and 9 in. long. 30 in.

2. A short way to write 4 ft. is 4′. A short way to write 6 in. is 6″. Find the perimeter of a rectangle measuring 10′ by 14′; 48′ of a rectangle measuring 11″ by 18″. 58″

3. Ann has a garden 24 ft. long and 18 ft. wide. (432 sq. ft.) Joe has a garden 22 ft. long and 20 ft. wide. (440 sq. ft.) Which garden has the larger area? Joe's How many square feet larger is it? 8 What is the perimeter of each garden? 84 ft. for both

4. Mr. Wood bought a roll of wire netting for a chicken yard. He had enough wire to make a yard 40′ by 42′. (164′) Could he use the same amount of wire and make the yard 35′ by 47′? 164′, yes Could it be 30′ by 52′? 164′, yes Could he make a square chicken yard that is 41′ on a side? 164′, yes

5. Which one of the chicken yards in ex. 4 has the largest area? The one 41′ x 41′ What shape has the largest chicken yard? Square

6. Mrs. Brown bought a rug 9′ by 12′. (108 sq. ft.) She put it in a room that was 12′ by 15′. (180 sq. ft.) How many square feet of floor in that room were not covered by the rug? 72 Draw a picture to help you in this problem.

7. For the rug in ex. 6 Mrs. Brown paid $.65 a square foot. How much did the rug cost? $70.20

8. Mr. West's driveway is $8\frac{1}{2}$ ft. wide and 120 ft. long. What is the area of Mr. West's driveway? 1020 sq. ft.

Find the perimeter (1) **and the area** (2) **of the rectangles with these measurements:** Emphasize that answers must be in correct units.

(1) (2) **9.**	**10 in. by 15 in.** 50 in. 150 sq. in.	**9′ by 14′** 46′ 126 sq. ft.	**7′ × 12′** 38′ 84 sq. ft.
10.	**11 ft. by 18 ft.** 58 ft. 198 sq. ft.	**7′ by 16′** 46′ 112 sq. ft.	**4″ × 10″** 28″ 40 sq. in.
11.	**14 yd. by 16 yd.** 60 yd. 224 sq. yd.	**5″ by 11″** 32″ 55 sq. in.	**6″ × 15″** 42″ 90 sq. in.
12.	**13 ft. by 20 ft.** 66 ft. 260 sq. ft.	**6″ by 10″** 32″ 60 sq. in.	**3′ × 11′** 28′ 33 sq. ft.

Review meaning of perimeter first (page 261). In discussing ex. 3 be sure pupils understand that perimeter is distance around garden and area is amount of surface covered by garden

Provide review of the four basic operations as applied to common fractions, decimal fractions, whole numbers.

Mixed Practice

Add and check:

1.	$6\frac{1}{3}$	$9\frac{3}{4}$	$4\frac{3}{8}$	$8\frac{5}{6}$	$1\frac{3}{4}$	$4\frac{5}{12}$	$2\frac{7}{8}$
	$2\frac{1}{3}$	$2\frac{1}{4}$	$5\frac{3}{8}$	$4\frac{5}{6}$	$2\frac{5}{8}$	$3\frac{3}{4}$	$5\frac{5}{16}$
	$8\frac{2}{3}$	12	$9\frac{3}{4}$	$13\frac{2}{3}$	$4\frac{3}{8}$	$8\frac{1}{6}$	$8\frac{3}{16}$
2.	166	249	397	63.4	19.0	2.75	1.45
	674	257	814	21.7	31.6	3.25	4.07
	538	656	769	19.8	28.9	4.50	3.84
	747	838	435	25.5	18.4	6.25	6.73
	2125	2000	2415	130.4	97.9	16.75	16.09

Subtract and check:

3.	$5\frac{7}{8}$	$4\frac{4}{5}$	8	$7\frac{1}{8}$	$4\frac{7}{8}$	$6\frac{3}{10}$	$5\frac{1}{4}$
	$2\frac{3}{8}$	$1\frac{2}{5}$	$2\frac{3}{4}$	$3\frac{7}{8}$	$2\frac{1}{4}$	$2\frac{4}{5}$	$1\frac{11}{16}$
	$3\frac{1}{2}$	$3\frac{2}{5}$	$5\frac{1}{4}$	$3\frac{1}{4}$	$2\frac{5}{8}$	$3\frac{1}{2}$	$3\frac{9}{16}$
4.	143	400	602	89.2	55.0	3.62	5.25
	98	187	599	49.7	36.9	2.65	2.97
	45	213	3	39.5	18.1	.97	2.28

Multiply. Check by going over your work:

5. $\frac{2}{3} \times 27$ 18 $1\frac{1}{2} \times 12$ 18 $2\frac{3}{8} \times 16$ 38 $5\frac{7}{8} \times 48$ 282

6. $\frac{3}{4} \times 24$ 18 $2\frac{1}{3} \times 21$ 49 $1\frac{3}{4} \times 28$ 49 $4\frac{3}{5} \times 25$ 115

7. $\frac{5}{8} \times 40$ 25 $4\frac{1}{4} \times 20$ 85 $6\frac{2}{3} \times 18$ 120 $7\frac{1}{2} \times 14$ 105

8. $\frac{5}{6} \times 18$ 15 $1\frac{1}{8} \times 24$ 27 $3\frac{2}{5} \times 10$ 34 $2\frac{3}{4} \times 12$ 33

Divide. Use remainders to give fractions in the quotients:

9. $915 \div 61$ 15 $903 \div 84$ $10\frac{3}{4}$ $2376 \div 33$ 72 $20{,}736 \div 24$ 864

10. $988 \div 26$ 38 $945 \div 35$ 27 $2961 \div 42$ $70\frac{1}{2}$ $18{,}432 \div 28$ $658\frac{2}{7}$

11. $833 \div 14$ $59\frac{1}{2}$ $987 \div 47$ 21 $7725 \div 25$ 309 $17{,}271 \div 19$ 909

Multiply and check the work:

12. 359×480 172,320 187×295 55,165 64×3690 236,160 59×3950 233,050

13. 827×843 697,161 278×706 196,268 81×1965 159,165 43×6148 264,364

14. 604×735 443,940 890×450 400,500 93×1276 118,668 67×1892 126,764

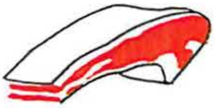
Check papers and analyze errors. Return them to pupils so that they may find and correct mistakes (some pupils may need help in doing this). Plan remedial work and further practice as needed.

Present problems with missing facts and problems without numbers.

What Is Missing?

For each problem there is a fact that you must know before you can work the problem. Supply a fact that will make a good problem and then work the problem:

1. Mrs. Hunt has $2.76 left after a shopping trip. How much did she spend?
2. Jane takes 10 min. longer to walk to school than Ann takes. How long does it take Jane to walk to school?
3. The bus for the fifth grade picnic cost $18.00. How much did each child have to pay?
4. Andy had 75¢ when he went to school. How much did he have left after buying his lunch?
5. Mrs. Hill bought a 4-pound roast for dinner. How much did she pay for 1 pound?



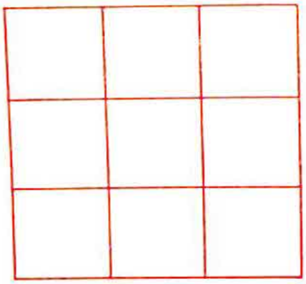
How Would You Do It?

6. You know how much the fifth grade party cost and how many children there are in the class. How do you find how much each child should pay if they share the cost equally? Divide the cost by the number of children.
7. You know how much money you had when you went to the store and how much you spent there. How do you find how much money you should have left? Subtract the amount you spent from the amount you had.
8. You know how much one movie ticket costs on Saturday. You also know how many children you have invited to your movie party next Saturday. How do you find how much all the tickets cost? Multiply the cost of 1 ticket by the number of children.
9. You know the weight of each of five fish you caught. How do you find the average weight of the fish? Add the five weights and divide by 5.
10. You know how many hours you worked each day last week. You also know that you worked a different number of hours each day. How do you find the number of hours you worked during the week? Add the different numbers.

Do ex. 1–5 with pupils since this is new activity. Encourage them to supply "reasonable" facts. Provide more problems like these to reinforce understandings. See page 198 for suggestions concerning ex. 6–10.

Show relation of square yards to square feet and of square feet to square inches. Develop table of square measure, including acres (pages 272-274).

Measuring in Square Yards


1 Square Yard

1. On the blackboard draw a square that has each side 1 yd. long. How many feet long is each side? 3 Mark off each side in feet and draw lines as shown at the left. The lines divide the square into how many square feet? 9 How many square feet are there in 1 square yard? 9

2. A garden is 9 yd. wide and 11 yd. long. How many square yards are there in the garden? 99

3. Betty measured the schoolroom floor. She found it was 12 ft. wide and 18 ft. long. What was the area of the floor in square feet? 216

4. Betty said she could change the area in ex. 3 to square yards by dividing by 9. Do you think Betty is right? How many square yards are there in 216 sq. ft.? 24

5. There is another way to find the area in ex. 3 in square yards. Change 12 ft. to 4 yd. and 18 ft. to 6 yd. Then find the area in square yards. What is it? 24 Does this check with ex. 4? Yes

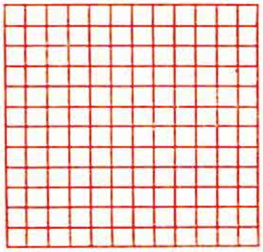
6. John's garden is 10 yd. wide and 15 yd. long. Find the number of square feet in the area of the garden. Use two different ways to find the number of square feet in the area. Do you get the same answer both times? 1350 sq. ft.; yes

Tell what numbers to put in the spaces:

7. 3 sq. yd. = . . . 27 sq. ft. 18 sq. ft. = . . . 2 sq. yd.
8. 9 sq. yd. = . . . 81 sq. ft. 54 sq. ft. = . . . 6 sq. yd.
9. 2 sq. yd. = . . . 18 sq. ft. 27 sq. ft. = . . . 3 sq. yd.
10. 8 sq. yd. = . . . 72 sq. ft. 36 sq. ft. = . . . 4 sq. yd.
11. 5 sq. yd. = . . . 45 sq. ft. 72 sq. ft. = . . . 8 sq. yd.

Follow suggestion in ex. 1 and draw a square yard on blackboard, then divide it into square feet. Pupils will see that the dimensions of the square in feet are 3 feet by 3 feet, and that 1 sq. yd. = 9 sq. ft.

Square Feet and Square Inches



1 Square Foot

1. On a large sheet of paper or the blackboard draw a square that has each side 1 ft. long. How many inches long is each side? 12 Mark off each side in inches. Then draw lines to divide the square into square inches, as shown at the right. How many square inches are there in 1 row? 12 How many rows are there? 12 How many are 12 × 12 sq. in.? 144 sq. in. Then how many square inches are there in 1 sq. ft.? 144

Have a pupil make drawing as suggested in ex. 1.

2. The picture shows that there are 144 sq. in. in 1 sq. ft. How many square inches are there in 2 sq. ft.? 288

3. A sheet of paper is 8 in. wide and 11 in. long. How many square inches are there in its area? 88 Is this more or less than 1 sq. ft.? Less than $\frac{1}{2}$ sq. ft.? More

4. Bill made a box 8 in. wide and 1 ft. 2 in. long. Find the area of the bottom of the box. 112 sq. in.

▶ You see that the width is given in inches and the length in feet and inches. Before finding the area, be sure that both the length and the width are given in the same unit. First change 1 ft. 2 in. to 14 in. Then find 8 × 14.

5. Find the area of a sidewalk 3 ft. wide and 20 yd. long. 20 sq. yd. Find the cost at $3.25 a square yard. $ 65.00

Find the areas of these rectangles. Be sure the length and the width are both in inches, or both in feet, or both in yards: Emphasize.

6. 3 ft. by 7 yd. 63 sq. ft. 6 in. by 1 ft. 4 in. 96 sq. in.

7. 8 in. by 2 ft. 192 sq. in. 4 ft. by 2 yd. 1 ft. 28 sq. ft.

8. 1 ft. by 1 yd. 3 sq. ft. 1 ft. by 2 ft. 1 in. 300 sq. in.

More Practice. See ㊾ on page 326.

Reinforce understanding of relation between sq. yd., sq. ft., sq. in. Cut out 1 sq. yd. from oil cloth or oak tag. Mark off the 9 sq. ft. contained in it. Shade and label 1 sq. ft. Measure and draw the 144 sq. in. 1 sq. ft. contains. Shade and label 1 sq. in.

Square Measure

1. The pictures on pages 272 and 273 show you that there are 9 sq. ft. in 1 sq. yd. and 144 sq. in. in 1 sq. ft. Here is a table giving these units of square measure. Try to learn it:

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
43,560 square feet = 1 acre (A.)

2. In the table above, the new unit of measure is the **acre.** It is used to measure very large areas of land. Farms and large fields are measured by the acre. How many square feet are there in 1 acre? 43,560 in 2 acres? 87,120

3. The school playground is 363 ft. long and 120 ft. wide. How many square feet are there in its area? 43,560 Is the area of the playground as large as 1 acre? Yes

4. How many square feet are there in $\frac{1}{4}$ acre? 10,890 in $\frac{1}{2}$ acre? 21,780 in $\frac{3}{4}$ acre? 32,670 in $1\frac{1}{2}$ acre? 65,340 in $1\frac{1}{4}$ acre? 54,450

5. John's father owns a piece of land 297 ft. long and 220 ft. wide. (65,340 sq. ft.) Is the area of his land $\frac{3}{4}$ acre, $1\frac{1}{4}$ acres, or $1\frac{1}{2}$ acres? $1\frac{1}{2}$ A.

6. Mr. Brown bought a big field and divided it into 8 lots each 121 ft. by 90 ft. Did he buy $1\frac{1}{2}$ acres, 2 acres, or $2\frac{1}{2}$ acres of land? 87,120 sq. ft., or 2 A.

7. Land in the country is usually sold by the acre. Mr. Hunt bought $4\frac{1}{2}$ acres of land at \$90 an acre. How much did all that land cost? \$ 405

8. In the city a square foot of land may sell for \$200. At this rate, find the cost of a building lot 75 ft. wide by 110 ft. long; \$1,650,000 of one 84 ft. wide by 125 ft. long. \$ 2,100,000

9. Measure your school playground if it is shaped like a rectangle. Is its area more or less than an acre?

Put table of square measure on board or class chart. Use ex. 9 to develop concept of size of acre; see G-96 for suggested procedure. Give pupils further work in changing from one square measure to another.

Oral Review

Give the answers:

1.	(8 × 9) + 6 78	(9 × 2) + 6 24	5 + (6 × 6) 41
2.	(7 × 6) + 4 46	(3 × 8) + 2 26	5 + (7 × 8) 61
3.	(5 × 8) + 3 43	(9 × 6) + 8 62	1 + (2 × 9) 19
4.	(4 × 7) + 2 30	(8 × 8) + 7 71	7 + (9 × 7) 70

5. How many yards are there in 150 ft. of wire? 50

400 114

6. Read these numbers: CD, CXIV, MCMLX. 1960

7. How many figures are there in the number **ten million?** 8

8. Change to lowest terms: $\frac{8}{16}$ $\frac{1}{2}$, $\frac{9}{12}$ $\frac{3}{4}$, $\frac{10}{15}$ $\frac{2}{3}$, $\frac{18}{24}$ $\frac{3}{4}$, $\frac{40}{50}$. $\frac{4}{5}$

9. Change to mixed numbers: $\frac{3}{2}$ $1\frac{1}{2}$, $\frac{5}{4}$ $1\frac{1}{4}$, $\frac{7}{3}$ $2\frac{1}{3}$, $\frac{8}{5}$ $1\frac{3}{5}$, $\frac{9}{2}$. $4\frac{1}{2}$

10. Find the sum of $2\frac{1}{2}$ yd. and $3\frac{1}{2}$ yd. 6 yd.

12 21 24 27 33

11. Find $\frac{3}{4}$ of each number: 16, 28, 32, 36, 44, 80. 60

15 21 30 36 60

12. Find $1\frac{1}{2}$ times each number: 10, 14, 20, 24, 40, 50. 75

13. Give the next three numbers after 999,999. 1 million, 1 million, 1 million 2

14. Count by 4's from 16 to 56; (1) from 92 to 108. (2) (1) 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56; (2) 92, 96, 100, 104, 108

15. Count by 6's from 37 to 61; (1) from 83 to 119. (2) (1) 37, 43, 49, 55, 61; (2) 83, 89, 95, 101, 107, 113, 119

16. Change these fractions to fractions having 12 as a common denominator: $\frac{1}{2}$ $\frac{6}{12}$, $\frac{1}{6}$ $\frac{2}{12}$, $\frac{1}{4}$ $\frac{3}{12}$, $\frac{1}{3}$. $\frac{4}{12}$

12, 13, 14, 15, 25

17. Count your change from 25¢ if you spend 12¢; from 50¢ if you spend 27¢; from $1.00 if you spend 38¢. 38, 39, 40, 50, $1.00

27, 28, 29, 30, 40, 50

18. Use the numbers 1, 2, and 5, or any two of them, and make an improper fraction; a mixed decimal; a proper fraction; a mixed number.

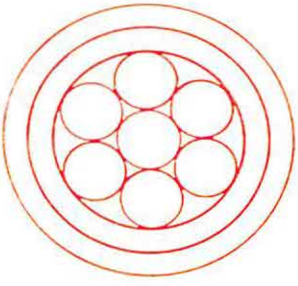
19. How many square feet equal 1 sq. yd.? 9 How many square yards are there in 72 sq. ft.? 8

20. A bushel of potatoes weighs 60 lb. How many pounds does 1 pk. of potatoes weigh? 15

Use this review to spot-check for class or individual weaknesses in skills and understandings. Group pupils who need further review or redevelopment. Let other pupils work at arithmetic corner on magic squares, original problems, and so on. Keep materials up to date.

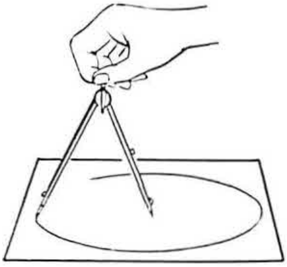
Present review of common geometric figures.

Studying Common Figures



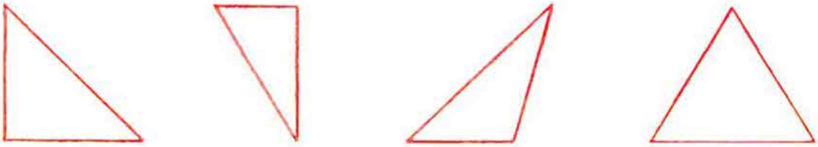
1. How many circles can you see in the picture at the left? 10 Be sure that you do not miss any of them.

2. Can you draw a circle on the blackboard, using chalk and a piece of string? Take a piece of string about 15 in. long. Tie the end of it around the middle of a piece of chalk. Your teacher will show you how to hold one end of the string against the blackboard with your left hand while you draw a circle on the board by moving the chalk with your right hand.



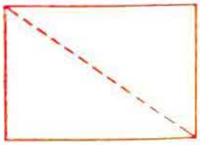
3. At the right you see a circle being drawn with a pair of compasses. If you have compasses, draw circles of different sizes.

4. A wheel has the shape of a circle. Name some other objects you often see that are shaped like circles.



5. The figures above are **triangles.** All triangles have 3 sides and 3 angles. Sometimes one of the angles is a right angle. Which of the triangles above have a right angle? The first and second

Ask pupils "why" they are right angles.



6. Draw a rectangle 4 in. long and 3 in. wide. Draw a line in the rectangle to divide it into two triangles as shown at the right. Do these triangles each have a right angle? Yes

7. Look around your schoolroom or out of a window and see if you can find one or more triangles. Also find a picture in a newspaper that shows some triangles. Buildings and bridges often have triangles in them.

Give pupils opportunity to follow suggestions in ex. 2–3. Extend ex. 4 by having pupils bring in pictures of objects shaped like circles, cut from magazines. In ex. 7 have pupils specify if their triangles have right angles.

Review division, addition, multiplication, and subtraction of whole numbers, including dollars and cents.

Keeping in Practice

Remind pupils to change fractions.

Divide. Use any remainder to give a fraction in the quotient:

1. 875 ÷ 25 35 902 ÷ 82 11 2380 ÷ 28 85 13,235 ÷ 21 $630\frac{5}{21}$
2. 924 ÷ 56 $16\frac{1}{2}$ 886 ÷ 29 $30\frac{16}{29}$ 3472 ÷ 60 $57\frac{13}{15}$ 16,394 ÷ 38 $431\frac{8}{19}$
3. 299 ÷ 23 13 816 ÷ 12 68 1560 ÷ 15 104 35,987 ÷ 53 679
4. 836 ÷ 19 44 857 ÷ 80 $10\frac{57}{80}$ 4762 ÷ 24 $198\frac{5}{12}$ 19,417 ÷ 27 $719\frac{4}{27}$
5. 840 ÷ 68 $12\frac{6}{17}$ 825 ÷ 42 $19\frac{9}{14}$ 8132 ÷ 16 $508\frac{1}{4}$ 20,496 ÷ 24 854
6. 448 ÷ 32 14 685 ÷ 47 $14\frac{27}{47}$ 2726 ÷ 58 47 33,192 ÷ 36 922
7. 682 ÷ 11 62 630 ÷ 35 18 9387 ÷ 74 $126\frac{63}{74}$ 14,308 ÷ 18 $794\frac{8}{9}$

Copy in columns, add, and check:

8. 9144 + 5297 + 6014 + 5480 25,935 30,745 + 17,829 48,574
9. 2938 + 1997 + 2766 + 3089 10,790 76,804 + 57,528 134,332
10. 5798 + 6695 + 3587 + 1527 17,607 25,782 + 25,669 51,451
11. 8568 + 1976 + 4963 + 5259 20,766 26,833 + 63,568 90,401
12. 4096 + 3184 + 1998 + 5706 14,984 42,185 + 23,916 66,101

Multiply and check the work:

13.	517	602	435	941	896	627
	483	539	162	918	240	600
	249,711	324,478	70,470	863,838	215,040	376,200
14.	820	768	423	489	915	785
	827	145	274	361	750	900
	678,140	111,360	115,902	176,529	686,250	706,500

Subtract. Check the work by adding: Stress.

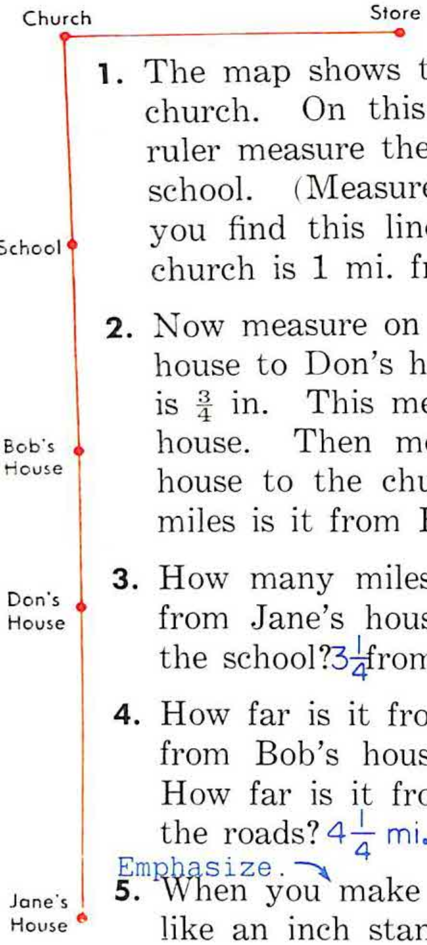
15.	$672.45	$758.77	$585.32	$140.35	$649.00
	573.79	559.76	454.76	47.58	434.66
	$ 98.66	$199.01	$130.56	$ 92.77	$214.34
16.	$204.93	$874.72	$621.50	$800.00	$926.57
	157.08	535.43	153.86	452.95	427.69
	$ 47.85	$339.29	$467.64	$347.05	$498.88

17. Add the numbers in ex. 15 and 16. Ex. 15: $1246.24, $1318.53, $1040.08, $187.93, $1083.66; ex. 16: $362.01, $1410.15, $775.36, $1252.95, $1354.26

Check papers and analyze errors. Have volunteers put work on board so pupils may discover reasons for their errors and discuss them. Provide remedial work.

Teach meaning and use of "drawing to scale," and how to read and make scale drawings (pages 278–280).

Drawing to Scale



1. The map shows two roads in the country that meet at the church. On this map 1 in. stands for 1 mi. With your ruler measure the length of the line from the church to the school. (Measure the distance between the 2 marks.) Do you find this line to be just 1 in.? Yes This means that the church is 1 mi. from the school.

Caution pupils to measure along vertical line.

2. Now measure on the map the length of the line from Bob's house to Don's house. If you measure correctly, the length is $\frac{3}{4}$ in. This means that Don's house is $\frac{3}{4}$ mi. from Bob's house. Then measure the length of the line from Bob's house to the church. How long is this line? 2 in. How many miles is it from Bob's house to the church? 2

3. How many miles is it from Jane's house to Don's house? $1\frac{1}{2}$ from Jane's house to Bob's house? $2\frac{1}{4}$ from Jane's house to the school? $3\frac{1}{4}$ from Jane's house to the church? $4\frac{1}{4}$

4. How far is it from the church to the store? $1\frac{1}{2}$ mi. How far is it from Bob's house to the store if he goes by the roads? $3\frac{1}{2}$ mi. How far is it from Don's house to the store if he goes by the roads? $4\frac{1}{4}$ mi.

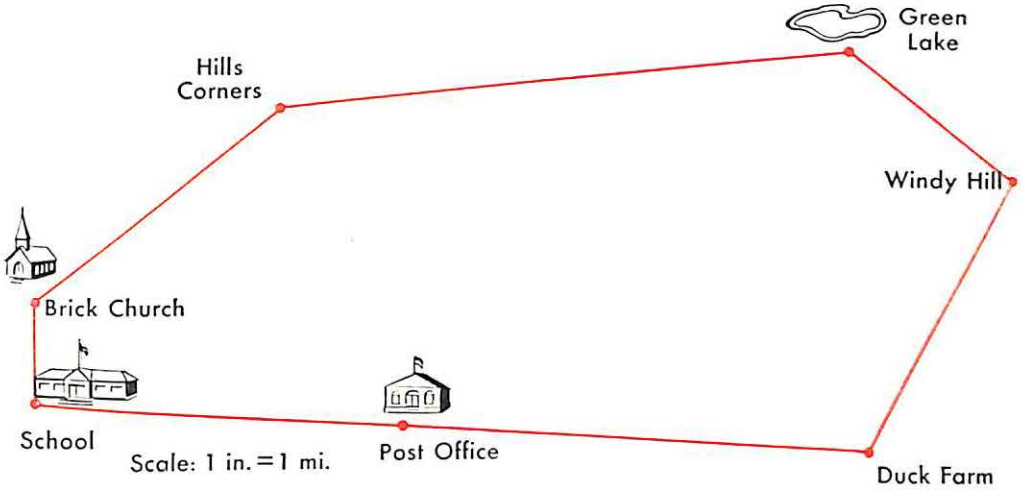
Emphasize.

5. When you make a drawing like a map and let a short line like an inch stand for a long distance like a mile, you are **drawing to scale.** On the map at the top of the page the scale is: 1 in. = 1 mi.

6. On the map above, suppose there were a straight road from Bob's house to the store. About how many miles would that distance be? $2\frac{1}{2}$ Use your ruler to measure it.

7. Draw a map like the one above but change the distances like this: From Jane's house to Don's house should be 1 mi.; from Don's house to Bob's house should be $1\frac{1}{4}$ mi.; from Bob's house to the school should be $3\frac{1}{2}$ mi.; from the school to the church should be $1\frac{3}{4}$ mi.; from the church to the store should be $2\frac{1}{4}$ mi. On your map let 1 in. = 1 mi.

Begin lesson by asking pupils how you could draw diagram of classroom on blackboard. They will see need for making representative drawing and that some standard for accuracy must be used. Then discuss ex. 1–6 with pupils.



The Bicycle Club

1. One day last summer the children in the Bicycle Club rode to Green Lake. They used the map above to find their way to Green Lake. On this map 1 in. = 1 mi. How many miles do 2 in. stand for? 2 mi.

2. The boys and girls met at school. First they rode from the school to the brick church. How many miles is that? $\frac{1}{2}$ On the map measure the distance between the two dots with a ruler. Remember that 1 in. on the map stands for 1 mi.

Ask pupils what $\frac{3}{4}$ in., $\frac{1}{2}$ in., $\frac{1}{4}$ in. stand for.

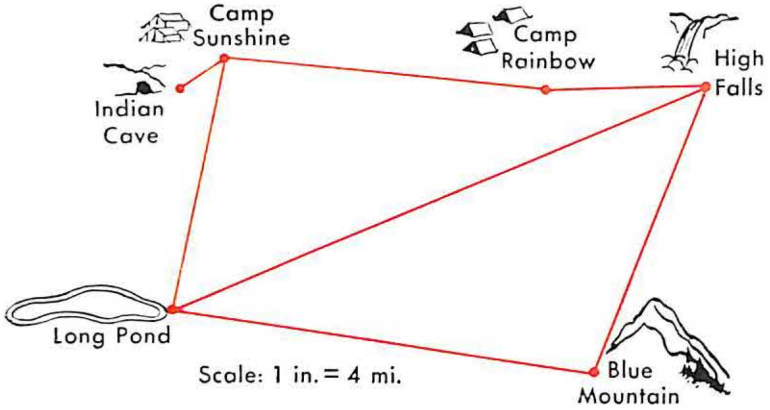
3. How far did they ride from the brick church to Hills Corners? $1\frac{1}{2}$ mi. Find the distance from Hills Corners to Green Lake. $2\frac{3}{4}$ mi. How far is it from school to Green Lake? $4\frac{3}{4}$ mi.

4. They came home another way. They rode from Green Lake to Windy Hill. How far is that? 1 mi. Then they rode to the duck farm. How many miles is that from Windy Hill? $1\frac{1}{2}$ from Green Lake? $2\frac{1}{2}$

5. From the duck farm the boys and girls rode back to school by way of the post office. How many miles is it from the duck farm to the post office? $2\frac{1}{4}$ from the duck farm to school? 4

6. How many miles in all was the trip from Green Lake back to school? $6\frac{1}{2}$ How many miles longer was the trip back from Green Lake than the trip going there? $1\frac{3}{4}$ How many miles in all was the round trip? $11\frac{1}{4}$

Do ex. 1–6 orally with pupils. Emphasize accuracy in measuring. Have pupils make own scale drawings to represent distances from their homes to school, to library, and so on. Be sure they indicate scale used.



Summer Camps

1. Last summer Ann went to Camp Sunshine and Bill went to Camp Rainbow. The map above shows the two camps and the roads around them. The scale on the map reads: 1 in. = 4 mi. This means that 1 in. on the map stands for 4 mi. on the ground. How many miles does $\frac{1}{4}$ in. stand for? 1 $\frac{1}{2}$ in.? 2 $2\frac{3}{4}$ in.? 3 Be sure this work is completely understood before pupils do ex. 2-6.

2. The children got off the train at High Falls and rode in a bus to the camps. How many miles is it from High Falls to Camp Rainbow? 3mi. from High Falls to Camp Sunshine? 9mi. Measure the lines with your ruler and then find the distance in miles.

3. How far is it from one camp to the other? 6 mi. How far is it from Camp Sunshine to Long Pond? 5mi. How far is it from Camp Rainbow to Long Pond by way of Camp Sunshine? 11mi. by way of High Falls? 14 mi. or 17 mi.

4. How far is it from High Falls to Long Pond? 11 mi. from High Falls to Long Pond by way of Blue Mountain? 14 mi. How much shorter is it to go directly from High Falls to Long Pond? 3 mi.

5. How many more miles is it from Camp Sunshine to Blue Mountain than from Camp Rainbow to Blue Mountain? 4 mi. (by shorter route)

6. How far is the girls' camp from Indian Cave? 1 mi. How far is the boys' camp from Indian Cave? 7 mi.

Emphasize that size of map to be drawn (or size of object) and space available on paper influence choice of scale. Give pupils further work in reading and interpreting scale measurements (1 in. = 12 mi., $\frac{1}{2}$ in. = ? mi., and so on).

Review basic concepts of measures.

Choosing the Unit of Measure

1. When your father tells the distance he drove the car, he gives it in **miles.** The **unit of measure** in this case is the **mile.** When you find the length of your room, you measure it in **feet** or **yards.** The mile would not be a good unit to use because it is too large. Always choose the unit of measure that makes the work easiest.

2. Can you tell the common units for measuring weight? Name some units for measuring liquids.

3. Name three units for measuring periods of time that are shorter than a week. Name two units for measuring periods of time that are longer than a week.

4. What unit of weight is used to measure the weight of a girl? Pound the weight of a truck full of sand? Ton the weight of a letter? Ounce

5. What unit of time is used to tell how long it takes you to walk across the street? Second to tell how old you are? Year to tell how long you are in school each day? Hour

Tell the unit of measure you should use to find

6. the length of a book. Inch

7. the time you sleep. Hour

8. the weight of coal. Ton

9. the weight of a cookie. Ounce

10. the width of a room. Foot

11. the weight of a man. Pound

12. the weight of a roast of meat. Pound

13. the distance an airplane flies in 3 hr. Mile

14. the amount of milk you drink in a year. Quart or gallon

15. the time it takes to walk a distance of 50 ft. Second

16. the time from next January to next October. Month

17. the number of eggs a year that your hens lay. Dozen or gross

18. the amount of ribbon on a large roll of ribbon. Yard

19. the time from 9 A.M. Monday to 9 A.M. Friday. Day

This review will help you determine whether class really understands measures. Pupils should be able to indicate which measure to use in these exercises. It may be necessary to redevelop these basic concepts.

Present problems which review rounding off large numbers, finding averages, computing elapsed time, using measures of weight.

Our Cotton Crop

1. Cotton is one of the important crops of the United States. Three states together grow about half the country's cotton. One year Texas grew 3,920,000 bales of cotton. The same year Mississippi grew 1,575,000 bales and California grew 1,450,000 bales. How many bales did these 3 states together grow? 6,945,000

2. Round off the answer you got in ex. 1 to the nearest million bales of cotton. 7,000,000

3. Cotton grows where there is a growing season of 200 days or more. This means that there must be no frost for 200 days. About how many months are there in 200 days? $6\frac{2}{3}$ Count 30 days to a month.

4. If the ground is prepared for planting cotton in the early part of March, in what month should the cotton be ready to pick? See ex. 3. September

5. It takes 60 days from the time the cotton is in flower until the boll, or pod, opens. If the cotton is in flower July 10, about what date should the boll open? Sept. 10

6. Cotton is picked both by hand and by machine. A man may pick as much as 400 lb. in an 8-hour day. What is the average number of pounds he can pick an hour? 50

7. A boy of 15 years won a prize for picking 129 lb. of cotton in 2 hr. How many pounds better was his average per hour than that in ex. 6? $14\frac{1}{2}$

Discuss problems with pupils who had errors to discover reasons for their mistakes.

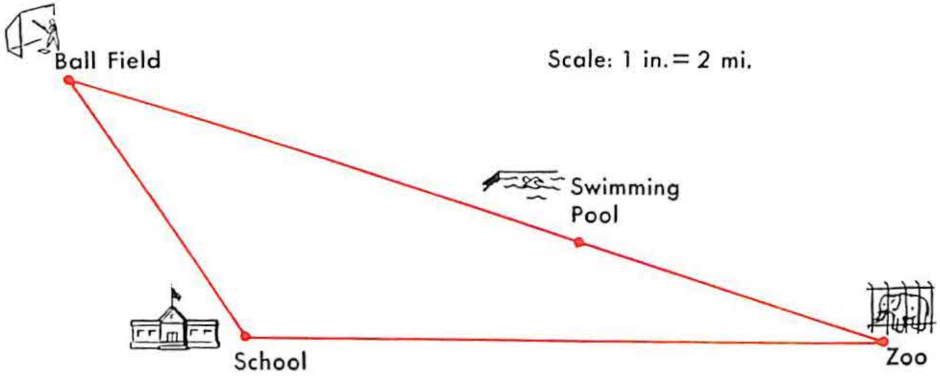
8. Many years ago before the cotton gin was invented, the cotton seeds were pulled away from the cotton lint by hand. It took one person a full day to separate 1 lb. of lint from the seeds. At that rate, how many days would it take a person to remove the seeds from enough cotton to make a bale containing 475 lb. of cotton? 475 If that person worked an average of 25 days a month, how many months would it take? 19 Do you know whether the cotton seeds are used?

9. The cotton gin is a machine that separates the seeds from the cotton. It was invented in 1793. How many years ago was that?

10. After the seeds have been removed by the cotton gin, the cotton is pressed into bales to be shipped. A bale weighs about 500 lb. This weight is made up of 475 lb. of cotton; the rest of the weight is wrapping. How many pounds does the wrapping weigh? 25 What part of the weight of a bale is wrapping? $\frac{1}{20}$ What part of a ton does a 500-pound bale of cotton weigh? $\frac{1}{4}$

11. The cotton belt of the United States is in the southern part of the country. Look up the names of 3 states in addition to those in ex. 1 that grow large crops of cotton. Try to find the number of bales of cotton these states grew last year or the year before.

Provide further work on scale drawing (pages 284-285).



Studying a Map

1. The children in Don's room made a map showing distances from school to the ball field and to the zoo. On their map 1 in. = 2 mi. With your ruler measure the distance on the map from school to the zoo. How many inches is it? 3 How many miles is it from school to the zoo? 6

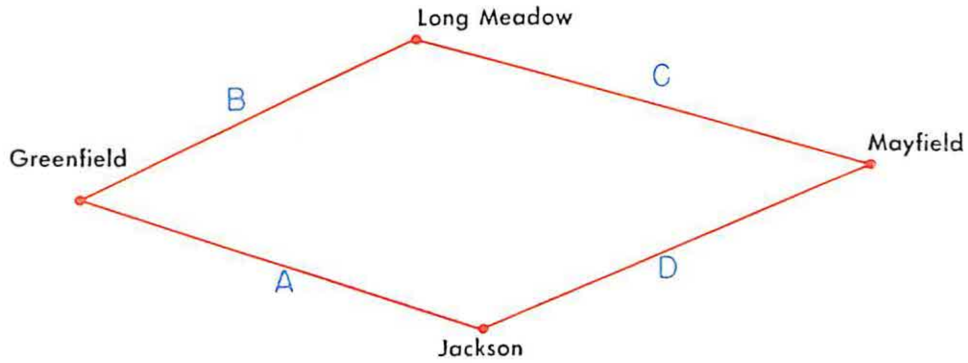
2. On the map find the distance in inches between these places. Then find the distance in miles:
   (a) From school to the ball field. $1\frac{1}{2}$ in., 3 mi.
   (b) From the ball field to the zoo. 4 in., 8 mi.
   (c) From the swimming pool to the zoo. $1\frac{1}{2}$ in., 3 mi.

3. How many miles is it from school to the swimming pool by way of the ball field? 8 from school to the swimming pool by way of the zoo? 9

4. How far is it from school to the ball field, to the zoo, and back to school the shortest way? 17 mi.

5. On paper copy the map at the top of the page, using the scale of 1 in. = 2 mi. On the map show these new places, using the same scale:
   Post office, which is 1 mi. east of the ball field.
   High school, which is 2 mi. west of the other school.
   Blue Lake, which is 6 mi. north of the zoo.
   Maple Farm, which is 4 mi. east of the zoo.

Before pupils do ex. 1-5, ask them how many miles are represented by $\frac{1}{2}$ in., $1\frac{1}{2}$ in., 2 in., and so on, using above scale. Some pupils may also need review of directions (north, east, south, west).



What Is the Distance?

1. The map above was drawn to scale but the scale is not given. Suppose you know that it is 16 mi. from Jackson to Greenfield. Can you tell the scale of the map from that? What is it? 2 in. = 16 mi., 1 in. = 8 mi.

2. Using the scale you found in ex. 1, tell how far it is from Greenfield to Long Meadow; 18 mi. from Long Meadow to Mayfield; 14 mi. from Mayfield to Jackson. 16 mi.

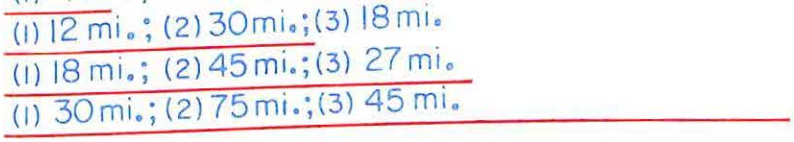
3. Measure each line below. How many (1) miles does each line stand for if the scale is 1 in. = 8 mi.?

(1) 4 mi.; (2) 10 mi.; (3) 6 mi.

(1) 12 mi.; (2) 30 mi.; (3) 18 mi.

(1) 18 mi.; (2) 45 mi.; (3) 27 mi.

(1) 30 mi.; (2) 75 mi.; (3) 45 mi.



How many miles long is each line above if (3) the scale is 1 in. = 20 mi.? (2) if the scale is 1 in. = 12 mi.?

4. On paper make a scale drawing of a chicken yard in the shape of a rectangle. Have the chicken yard 12 ft. wide and 28 ft. long. Let 1 in. = 4 ft.

5. On paper draw a room in the shape of a rectangle. Have the room 20 ft. wide by 30 ft. long. For your scale use 1 in. = 10 ft.

6. Look again at the map above ex. 1. Suppose the scale is 1 in. = 40 mi. Tell the four distances shown on the map. A, 80 mi.; B, 70 mi.; C, 90 mi.; D, 80 mi.

Through discussion with pupils of ex. 1–6, lead them to see that actual length and width of an area depend upon scale used.

Provide end-of-year tests in all fundamental skills taught or retaught in Grade 5 (pages 286-298).

Addition Review

1. Take the test on the 100 addition facts on page 5. See answers on page 5.

Give the answers as quickly as you can:

2. 28 + 7 35 77 + 9 86 94 + 6 100 58 + 5 63

3. 39 + 4 43 16 + 7 23 82 + 9 91 45 + 6 51

4. 56 + 8 64 43 + 8 51 61 + 7 68 29 + 8 37

5. Add the numbers in ex. 8 and 9 on page 287. Ex.8: 1339, 2298, 8211, 16,730, 7189; ex.9: 1213, 2808, 11,427, 15,155, 7702

Add up. Check the work by adding down:

6.	14	24	46	24	54	32	43
	65	56	79	69	93	54	97
	29	42	31	25	99	45	18
	86	37	68	36	52	36	81
	37	63	75	58	68	10	75
	31	14	34	27	76	88	49
	42	55	12	27	18	45	37
	304	291	345	266	460	310	400
7.	344	235	335	391	889	267	562
	203	572	588	925	702	501	360
	796	123	662	187	227	485	359
	457	694	416	591	195	736	425
	670	578	272	176	880	908	653
	359	421	637	668	536	633	641
	2829	2623	2910	2938	3429	3530	3000
8.	203	483	742	137	692	240	270
	895	710	243	841	850	542	493
	418	269	174	108	327	659	156
	834	604	916	891	139	709	436
	357	438	273	735	749	158	642
	2707	2504	2348	2712	2757	2308	1997

Copy in columns, add, and check:

9. $294.64 + $372.55 + $177.08 + $142.63 + $262.43 $1249.33

10. $593.32 + $901.85 + $77.68 + $806.10 + $632.25 $3011.20

11. $831.00 + $89.57 + $337.54 + $70.66 + $453.19 $1781.96

12. $399.28 + $45.11 + $510.95 + $578.00 + $42.76 $1576.10

Note results of these tests on progress cards to show improvements and areas of weakness.

Subtraction and Multiplication

1. Take the test on the 100 subtraction facts on page 12. See answers on page 12.

Give the answers as quickly as you can:

2. 65 − 9 56　　35 − 12 23　　85 − 30 55　　47 − 15 32

3. 71 − 4 67　　56 − 24 32　　76 − 41 35　　68 − 34 34

Subtract the smaller number from the larger. Check: Stress.

4. 524; 248 276　　2934; 7000 4066　　28,369; 81,327 52,958

5. 800; 475 325　　6372; 2685 3687　　28,175; 11,378 16,797

6. 545; 728 183　　3654; 2557 1097　　92,083; 65,257 26,826

7. 247; 295 48　　1456; 4000 2544　　34,993; 74,687 39,694

Subtract and check:

8.	942 397 545	1423 875 548	5065 3146 1919	8734 7996 738	4000 3189 811
9.	944 269 675	1825 983 842	7200 4227 2973	8219 6936 1283	5916 1786 4130

10. Use the test on page 5 as a multiplication test. See answers for ex. 1, page 19, on G-15.

Multiply and check your work:

11. 91 × 63 5733　　79 × 1285 101,515　　135 × 237 31,995　　307 × 706 216,742

12. 38 × 74 2812　　24 × 3570 85,680　　380 × 521 197,980　　129 × 268 34,572

13. 54 × 96 5184　　18 × 6098 109,764　　462 × 850 392,700　　250 × 541 135,250

14. 29 × 79 2291　　63 × 2803 176,589　　234 × 649 151,866　　607 × 914 554,798

15. 67 × 67 4489　　17 × 3345 56,865　　851 × 916 779,516　　164 × 429 70,356

16. 75 × 89 6675　　92 × 2046 188,232　　284 × 739 209,876　　875 × 808 707,000

17. Multiply by 300:　389 116,700　　125 37,500　　647 194,100　　294 88,200　　765 229,500

18. Multiply by 450:　831 373,950　　507 228,150　　924 415,800　　648 291,600　　392 176,400

19. Multiply by 206:　716 147,496　　305 62,830　　849 174,894　　270 55,620　　586 120,716

If pupils need extra summer work, as evidenced by results of tests (pages 286-298), refer them to specific pages in text, or "More Practice," pages 310-326.

Review Problems

1. At 5¢ each, how many pencils can you get for 75¢? 15

2. Sally went shopping for her mother. She bought 2 lb. of lamb chops at 89¢ a pound and a $5\frac{1}{2}$-pound roast at 60¢ a pound. How much was her bill? $5.08

3. Susan needed a pair of shoes and a hat. She had $17.93 in her bank. She spent $6.75 for shoes and $3.00 for a hat. How much money did she have left? $ 8.18

4. Joe is now $56\frac{3}{4}$ in. tall. His mother told him that he had grown $2\frac{3}{4}$ in. since last year. How tall was Joe a year ago? 54 in.

5. Find the average of 24 mi., 19 mi., 17 mi., and 20 mi. 20 mi.

6. Jane wants a new raincoat. In a window she saw one that she likes. It costs $7.80. If Jane can save 65¢ a week, how long will it take her to save enough to buy the raincoat? 12 wk.
   ▶ First change $7.80 to cents.

7. Next week Mr. Reed must make a trip of 209 mi. If he can average 38 mi. an hour, about how many hours will it take him to make the trip? $5\frac{1}{2}$

8. When Mary Ann counted the money in her bank last week she had $.65. This week her father gave her $.45 for her bank. How much money has Mary Ann now? $1.10

9. The sewing class made 9 aprons to sell. The cloth for all the aprons cost $2.60, the braid cost $.72, and the thread cost $.10. How much did one apron cost? $.38

10. Mary turned in $15.00 and Don turned in $13.00 for tickets they sold for the school play. How many tickets did each one sell if the tickets sold for 25¢ each? Mary, 60; Don, 52
    ▶ Change $15.00 and $13.00 to cents.

Remind pupils to read problems carefully to determine what problem asks, facts known, process or processes to use, how to write problem in numerical form. Stress labeling of answers and possibility of hidden questions.

1. Take the test on the 90 division facts on page 31. See answers on page 31.

Give the answers as quickly as you can:

2.	3)189 63	4)240 60	5)455 91	4)37 9 R1	2)15 7 R1	6)55 9 R1
3.	2)264 132	6)186 31	3)246 82	3)19 6 R1	4)29 7 R1	9)75 8 R3
4.	5)350 70	2)144 72	7)490 70	5)31 6 R1	3)26 8 R2	4)19 4 R3

Divide. Write R before remainders, if there are any: Stress.

5.	10,564 ÷ 38 278	13,243 ÷ 41 323	40,851 ÷ 89 459
6.	15,501 ÷ 82 189 R3	14,232 ÷ 24 593	73,959 ÷ 77 960 R39
7.	34,381 ÷ 35 982 R11	44,876 ÷ 59 760 R36	15,622 ÷ 45 347 R7
8.	36,208 ÷ 73 496	32,490 ÷ 40 812 R10	27,336 ÷ 68 402
9.	10,982 ÷ 19 578	33,956 ÷ 52 653	22,968 ÷ 36 638

10. Divide each by 32: 927 28 R31 1472 46 2176 68 2336 73 3040 95

11. Divide each by 25: 925 37 1600 64 2031 81 R6 2175 87 2350 94

12. Divide each by 29: 881 30 R11 2697 93 5900 203 R13 2262 78 9106 314

Divide. Use the remainders to give fractions in the quotients: Stress.

13.	75)2750 $36\frac{2}{3}$	56)1988 $35\frac{1}{2}$	84)6636 79	90)7391 $82\frac{11}{90}$	42)35154 837
14.	25)2455 $98\frac{1}{5}$	17)4403 259	27)1821 $67\frac{4}{9}$	48)6048 126	63)54167 $859\frac{50}{63}$
15.	18)6552 364	66)4653 $70\frac{1}{2}$	81)2187 27	72)6840 95	39)27495 705

16. At 25 for $74.50, find the cost of 1 book. $2.98

17. At 12 for $107.40, find the cost of 1 sled. $8.95

18. Today Jim took in $11.90 from the sale of newspapers at 5¢ each. How many papers had he sold? 238

▶ Change $11.90 to 1190¢.

Fraction Review

Add. Check the work by going over it:

1.	$\frac{1}{5}$ $\frac{3}{5}$ $\frac{4}{5}$	$4\frac{2}{3}$ $1\frac{2}{3}$ $6\frac{1}{3}$	$6\frac{3}{8}$ $3\frac{1}{8}$ $9\frac{1}{2}$	$2\frac{9}{16}$ $4\frac{9}{16}$ $7\frac{1}{8}$	$9\frac{1}{2}$ $5\frac{7}{12}$ $5\frac{1}{12}$	$5\frac{7}{10}$ $1\frac{1}{2}$ $7\frac{1}{5}$
2.	$\frac{7}{8}$ $\frac{5}{8}$ $\frac{1}{8}$ $1\frac{5}{8}$	$2\frac{1}{2}$ $3\frac{5}{6}$ $1\frac{2}{3}$ 8	$4\frac{1}{2}$ $8\frac{1}{3}$ $2\frac{1}{3}$ $15\frac{1}{6}$	$6\frac{3}{10}$ $2\frac{7}{10}$ $4\frac{1}{10}$ $13\frac{1}{10}$	$9\frac{5}{12}$ $1\frac{3}{4}$ $6\frac{1}{2}$ $17\frac{2}{3}$	$8\frac{11}{16}$ $2\frac{5}{8}$ $3\frac{1}{2}$ $14\frac{13}{16}$

Subtract. Check the work by going over it:

3.	$\frac{5}{6}$ $\frac{1}{6}$ $\frac{2}{3}$	6 $4\frac{2}{3}$ $1\frac{1}{3}$	$2\frac{1}{3}$ $1\frac{5}{6}$ $\frac{1}{2}$	$4\frac{1}{5}$ $3\frac{9}{10}$ $\frac{3}{10}$	$9\frac{5}{12}$ $7\frac{2}{3}$ $1\frac{3}{4}$	$3\frac{5}{8}$ $1\frac{1}{16}$ $2\frac{9}{16}$
4.	$\frac{1}{2}$ $\frac{1}{6}$ $\frac{1}{3}$	$5\frac{3}{4}$ $4\frac{1}{4}$ $1\frac{1}{2}$	$5\frac{1}{3}$ $2\frac{3}{4}$ $2\frac{7}{12}$	$4\frac{11}{16}$ $2\frac{5}{16}$ $2\frac{3}{8}$	$8\frac{7}{10}$ $6\frac{4}{5}$ $1\frac{9}{10}$	$7\frac{1}{2}$ $3\frac{11}{12}$ $3\frac{7}{12}$

5. Add the numbers in ex. 3 and 4.

Ex. 3: $1, 10\frac{2}{3}, 4\frac{1}{6}, 8\frac{1}{10}, 17\frac{1}{12}, 4\frac{11}{16}$; ex. 4: $\frac{2}{3}, 10, 8\frac{1}{12}, 7, 15\frac{1}{2}, 11\frac{5}{12}$

Multiply. Check the work by going over it:

6.	48 $2\frac{1}{2}$ 120	32 $5\frac{3}{4}$ 184	30 $3\frac{2}{3}$ 110	24 $2\frac{5}{8}$ 63	40 $1\frac{1}{8}$ 45	45 $4\frac{2}{5}$ 198

Copy and find the answers:

7. $\frac{5}{6} \times 36$ 30 $\frac{11}{12} - \frac{5}{12}$ $\frac{1}{2}$ $2\frac{1}{2} - 1\frac{4}{5}$ $\frac{7}{10}$ $1\frac{2}{3} + 3\frac{5}{6} + 1\frac{7}{12}$ $7\frac{1}{12}$

8. $\frac{5}{8} \times 72$ 45 $\frac{9}{16} - \frac{1}{16}$ $\frac{1}{2}$ $3\frac{1}{2} - 2\frac{3}{4}$ $\frac{3}{4}$ $1\frac{3}{4} + 2\frac{1}{2} + 5\frac{3}{8}$ $9\frac{5}{8}$

9. $\frac{4}{5} \times 15$ 12 $\frac{7}{10} - \frac{3}{10}$ $\frac{2}{5}$ $4\frac{7}{8} - 1\frac{3}{8}$ $3\frac{1}{2}$ $6\frac{3}{4} + 2\frac{1}{2} + 4\frac{3}{4}$ 14

10. $\frac{2}{3} \times 18$ 12 $\frac{15}{16} - \frac{7}{16}$ $\frac{1}{2}$ $10 - 7\frac{1}{2}$ $2\frac{1}{2}$ $1\frac{1}{6} + 4\frac{1}{6} + 3\frac{5}{12}$ $8\frac{3}{4}$

11. Mrs. Hunt bought a roast weighing $6\frac{3}{4}$ lb. It cost \$.56 a pound. How much did Mrs. Hunt pay for the roast? \$3.78

12. How much will $\frac{7}{8}$ yd. of silk cost at \$4.00 a yard? \$3.50

1. Joe buys his lunch at school. Last week he spent these amounts for lunch: 28¢, 33¢, 27¢, 30¢, 32¢. What was the average amount he spent a day for lunch? 30¢

2. Bill wants some skates that cost $4.95. If he can save 45¢ each week, in how many weeks will he be able to buy the skates? Change $4.95 to cents before you divide. 11 wk.

3. A ship made a trip of 3864 mi. in 7 da. What was the number of miles the ship averaged a day? 552

4. Mr. Young planned to meet Mr. Gray at the station $\frac{3}{4}$ hr. before train time. If the train leaves at 5:28 P.M., at what time should Mr. Young reach the station? 4:43 P.M.

5. The average yearly rainfall for Greenfield is 42.03 in. In Oldtown the average is 37.22 in. How much more rain would you expect to have if you lived in Greenfield than if you lived in Oldtown? 4.81 in.

6. Mrs. Long bought $\frac{1}{2}$ doz. eggs for 28¢ and $\frac{3}{4}$ lb. of chopped meat at 60¢ a pound. What was her change from $1.00? $.27

7. A bus averages about 42 mi. per hour. At that rate, how far will it travel in 13 hr.? 546 mi.

8. Mary's father said he would put a fence around her garden if she figured how much wire netting she needed. Her garden is 8 ft. by 13 ft. How much does Mary need? 42 ft.

9. At a sale Sally bought three pieces of cotton cloth. She got $2\frac{1}{2}$ yd., $1\frac{7}{8}$ yd., and $2\frac{1}{4}$ yd. How many yards of cloth did Sally buy all together? $6\frac{5}{8}$

Yes or No

Read each statement. Then tell whether it is right or wrong by saying "Yes" or "No":

1. $9\frac{3}{8}$ is the same as $8\frac{11}{8}$. Yes
2. 14 oz. is the same as $\frac{7}{8}$ lb. Yes
3. 15,000 ft. is more than 3 mi. No
4. The year 1956 was a leap year. Yes
5. The sum of $4\frac{3}{5}$ and $3\frac{2}{5}$ is $7\frac{5}{10}$. No
6. The product of 60 and 200 is 62,000. No
7. The number MCMXLV can be written 1965. No
8. The number $4\frac{5}{6}$ is a mixed decimal. No
9. The average of 7, 2, 8, 4, and 9 is 6. Yes
10. The fraction $\frac{12}{18}$ is equal to the fraction $\frac{2}{3}$. Yes
11. These three fractions are all equal: $\frac{8}{12}$, $\frac{10}{15}$, $\frac{15}{20}$. No
12. The cost of $7\frac{1}{2}$ yd. of cloth at $2 a yard is $15. Yes
13. The value of 4 quarters, 5 dimes, and 6 nickels is $1.80. Yes
14. If the scale on a map is 1 in. = 3 mi., a line 2 in. long on the map stands for a distance of 5 mi. No
15. The area of a floor 15 ft. long and 12 ft. wide is 180 sq. ft., or 20 sq. yd. Yes
16. The perimeter of the floor in ex. 15 is 27 ft. No
17. In the fraction $\frac{7}{16}$, 16 is the denominator and 7 is the numerator. Yes
18. When 2 candy bars are divided equally among 3 boys, each boy gets $\frac{2}{3}$ candy bar. Yes
19. Grandfather has lived on a farm 43 yr. Bill says this is nearly 5 decades. No
20. A good estimate of the sum of $3.09, $4.98, $7.95, and $2.99 is $19.00. Yes

Review Problems

1. Jim and Tom bought a duck and 6 little ducklings for their pond. The duck cost $1.60 and the ducklings were $3.00 a dozen. What was each boy's share of the cost? $1.55

2. Bill weighs $68\frac{1}{4}$ lb. His brother weighs $43\frac{1}{2}$ lb. Bill weighs how many more pounds than his brother? $24\frac{3}{4}$

3. Mrs. Gray bought 12 oz. of meat. How much did the meat cost if it sold for 76¢ a pound? 57¢

4. On a vacation trip Jim's father drove 770 mi. He used 35 gal. of gasoline all together. How many miles per gallon did he average on this trip? 22

5. Miss Black ordered 29 English books for her class. They cost $55.97 in all. Find the cost of 1 book. $1.93

6. Don's father averages about 18 mi. on a gallon of gasoline. The tank of his car holds 23 gal. How far can he drive if his tank is full of gasoline? 414 mi.

7. Mr. Brown traveled 560 mi. in 2 days. If he went 320 mi. the first day, how far did he go the second day? 240 mi.

8. Jack's chicken yard is 12 ft. by 12 ft. (144 sq. ft.) Joe's chicken yard is 8 ft. by 16 ft. (128 sq. ft.) Which boy's chicken yard has the larger area? Jack's How much larger is it? 16 sq. ft.

9. At the store Susan bought $\frac{5}{8}$ lb. of ground meat and $\frac{1}{2}$ lb. of sandwich meat. How much meat did Susan buy? $1\frac{1}{8}$ lb.

10. Don ran 100 yd. in $19\frac{3}{5}$ sec. Dick ran it in $21\frac{1}{2}$ sec. How much less time did Don take than Dick? $1\frac{9}{10}$ sec.

11. One kind of cheese sells at 64¢ a pound. How much must Mrs. White pay for a piece that weighs 2 lb. 7 oz.? 156¢, or $1.56

▶ First change 7 oz. to a fraction of a pound.

Decimal Review

Write these numbers in figures:

1. Three hundred nineteen and four tenths. 319.4

2. One hundred fifty-eight and seven hundredths. 158.07

Write each number as a decimal or a mixed decimal:

3. $\frac{7}{10}$ .7 $4\frac{8}{10}$ 4.8 $\frac{37}{100}$ .37 $7\frac{25}{100}$ 7.25 $6\frac{7}{100}$ 6.07 $9\frac{11}{50}$ 9.22 $4\frac{17}{20}$ 4.85

Copy in columns, add, and check:

4. 39.7 + 51.6 + 27.1 + 54.7 173.1 423.9 + 734.2 1158.1

5. 5.48 + 2.97 + 8.34 + 3.06 19.85 58.38 + 53.28 111.66

6. 7.46 + 6.12 + 6.93 + 7.87 28.38 19.17 + 17.99 37.16

7. 82.8 + 67.4 + 94.7 + 61.8 306.7 524.6 + 348.3 872.9

8. In a timetable the distance from Greenfield to Crown Point is given as 75.8 mi. How many miles is the trip from Greenfield to Crown Point and return? 151.6

9. In Chester Mr. Wells paid 25.3¢ per gallon for gasoline. In New Town he paid 23.8¢ per gallon. What is the difference in the price Mr. Wells paid per gallon of gasoline? 1.5¢

10. On Monday 1.74 in. of rain fell. On Tuesday 2.08 in. fell. How many inches of rain fell on the two days? 1.74

Subtract and check your work:

11.	9.2 6.7 2.5	62.0 48.5 13.5	9.83 4.68 5.15	85.34 25.47 59.87	145.0 46.9 98.1	54.62 26.96 27.66
12.	5.1 0.9 4.2	56.5 25.7 30.8	3.70 3.54 .16	41.28 13.69 27.59	706.7 457.4 249.3	83.75 59.66 24.09
13.	9.6 4.9 4.7	53.3 35.7 17.6	3.14 2.68 .46	59.98 17.23 42.75	825.2 359.8 465.4	57.37 33.99 23.38

14. Add the numbers in ex. 11–13. Ex. 11: 15.9, 110.5, 14.51, 110.81, 191.9, 81.58; ex. 12: 6.0, 82.2, 7.24, 54.97, 1164.1, 143.41; ex. 13: 14.5, 89.0, 5.82, 77.21, 1185.0, 91.36

Review Problems

1. At a sale Ann bought a dress for \$8.25. The dress had been marked \$11.00 before the sale. How much did Ann save by buying the dress at the sale? \$ 2.75

2. Mr. Green earned \$5400 in all last year. How much was that for 1 month? \$ 450

3. The fifth grade children all gave money to the Red Cross. They had 5 half dollars, 9 quarters, 15 dimes, and 22 nickels. How much money did they give to the Red Cross? \$ 7.35

4. Jean weighs 64 lb. She has gained $8\frac{3}{4}$ lb. during this last year. How much did she weigh a year ago? $55\frac{1}{4}$ lb.

5. Mrs. North bought a roast that weighed 5 lb. 9 oz. It was 64¢ a pound. How much did the roast cost? 356¢, or \$ 3.56

6. Bob and Joe have a playroom that is 16 ft. by 24 ft. How many square feet are there in the area of the floor? 384

7. Mrs. West's milk bill in March was \$16.45. That was about how much, on the average, per day? \$.53 R2 ¢, or about \$.53

8. Mary and Bill keep chickens. Last month the feed for them cost \$6.25. They got 210 eggs which they sold for \$.50 a dozen. How much money did they make last month? \$ 2.50

9. The fifth grade girls made candy for their bake sale. They used 4 lb. of sugar at 12¢ a pound, $\frac{2}{3}$ qt. of milk at 24¢ a quart, 8 oz. of chocolate at 88¢ a pound, and butter worth 19¢. How much did all these things cost? 127 ¢, or \$ 1.27

10. Jane has \$3.00 to spend for plants for her garden. If she pays 15¢ apiece for the plants, how many plants can she buy? 20 If she pays 12¢ apiece, how many can she buy? 25

Do You Know These Words?

In ex. 1 to 8 show that you know what each word means by using it in a sentence or by giving an example:

1. area

2. square

3. decimal

4. fraction

5. average

6. rectangle

7. perimeter

8. mixed decimal

9. Find the perimeter of a rectangle 9 ft. by 12 ft. 42 ft.

10. Find the area of the rectangle in ex. 9. 108 sq. ft.

11. Find the area of a square having each side 18 in. 324 sq. in.

12. Find the perimeter of the square in ex. 11. 72 in.

13. Write an improper fraction, using the numbers 7 and 9. $\frac{9}{7}$

14. Find the average of 26, 18, 17, 31, and 28. 24

Which Facts Are Not Needed?

Tell the numbers in each problem that are not needed to find the answer. Then find the answer:

15. Bill is 12 yr. old and weighs 80 lb. Joe is 13 yr. old and weighs 96 lb. What is the difference in their weights? "12 yr." and "13 yr." not needed; 16 lb.

16. Sam's dog weighs 16 lb. One can of dog food will feed him for 2 da. How many cans of food will the dog need during the month of April? "16 lb." not needed; 15

17. On a trip the Bicycle Club rode 18 mi. during the first 3 hr., 10 mi. during the next 2 hr., and 11 mi. during the next 3 hr. How far did they ride in all? "3 hr.," "2 hr.," and "3 hr." not needed; 39 mi.

18. Mrs. Martin bought a $3\frac{1}{2}$-pound roast for $2.88. How much change did she get from a five-dollar bill? "$3\frac{1}{2}$ pound" not needed; $2.12

19. At a party there were 8 doz. cookies for 32 children. The cookies cost 46¢ a dozen. What did the cookies cost? "32 children" not needed; 368¢, or $3.68

Using Measures in Problems

1. Each day after school Jim delivers groceries for Mr. West. Last week he worked 45 min., 50 min., 40 min., 35 min., and 40 min. How many hours did Jim work last week? $3\frac{1}{2}$

2. Sally goes to school 9 mo. each year. What part of each year does Sally go to school? $\frac{9}{12}$ yr., or $\frac{3}{4}$ yr.

3. Jean sealed and stamped a pile of letters for her father. She did 105 letters in 35 min. How many letters was that per minute? 3 At that rate, how many could she do in 1 hr.? 180

4. Mrs. Gray canned 20 qt. of berries last summer. What part of a bushel of berries did she can? $\frac{5}{8}$

5. Ann and Jane missed the 8:56 A.M. train to the city and had to wait for the 9:27 A.M. train. How many minutes is the time between these two trains? 31

6. Betty is 57 in. tall and her brother is 5 ft. 4 in. tall. Which one is taller? How much taller? Betty's brother is 7 in. taller.

7. Bill has a garden 12 ft. by 12 ft. (144 sq. ft.) Joe's garden is 10 ft. by 14 ft. (140 sq. ft.) Which garden has the larger area? Bill's

8. At 48¢ a pound, find the cost of 5 lb. 6 oz. of meat. 258¢, or $2.58

9. Mr. King has a valuable lot that is 120 ft. long and 90 ft. deep. He will sell it at $2 a square foot. How much does Mr. King want to get for the lot? $21,600

10. How many feet are there in 1 mi.? (1) in $2\frac{1}{2}$ mi.? (2) The highest mountain in the world is 29,028 ft. high. Is that nearer 5 mi. (3) or $5\frac{1}{2}$ mi. (4) high? (5) (1) 5280; (2) 13,200; (3) 26,400; (4) 29,040; (5) nearer $5\frac{1}{2}$ mi.

11. Tom wants to make a rabbit pen that is 17 ft. wide and 27 ft. long. How many feet of wire netting does he need? 88 Tom's father will give him a 100-foot roll of wire netting. Will that be enough wire for his rabbit pen? Yes

What Fact Is Missing?

For each problem there is a fact you need to know before you can work the problem. Supply a fact that will make a good problem and then work the problem:

1. Mary took $3.89 out of her bank to pay for her mother's birthday present. How much money was left in her bank?
2. The paper says that there were 3278 more people at the Pleasant Valley Fair yesterday than were there a year ago. How many people were at the fair a year ago?
3. Mrs. Gates bought each of the twins a new hat for Easter. The hats cost $3.95 each. How much change should Mrs. Gates receive?
4. The Bicycle Club rode 315 mi. in all on their trips last summer. How many miles did they average per trip?

5. After paying the gas bill for her mother, Jane had $.68 left. How much money had she at first?
6. Ann and Jack both raise chickens. Jack has 38 more little chicks than Ann. How many little chicks has Ann?
7. Find the cost of milk for a month at 24¢ a quart.
8. The fifth grade boys are to have a picnic. Sandwiches are 15¢ each and each boy wants 2 sandwiches. How much will the sandwiches for all the boys cost?
9. Mr. Fox bought a large box of oranges which he sold at 60¢ a dozen. How much did he get for all the oranges?
10. On Saturdays Sam cuts grass for the neighbors. Last week he made $4.50. How much did Sam earn, on the average, per hour?
11. June bought a coat for $12.98, which was less than the marked price of the coat. How much money did June save?

Present last set of timed tests on basic operations.

Testing Your Skill

Addition Test

Add. Write the answers on folded paper: Time: 4 min.

1.	32	74	22	86	39	44	28	67
	56	12	95	65	50	89	75	31
	34	17	87	52	69	73	73	34
	19	91	40	85	21	27	26	60
	41	68	68	18	53	74	37	41
	32	95	10	42	84	96	65	59
	76	33	31	67	45	38	69	45
	290	390	353	415	361	441	373	337

Subtraction Test

Subtract. Write the answers on folded paper: Time: 4 min.

2.	55517 49980 5537	17727 9487 8240	60000 25837 34,163	10833 8535 2298
3.	62475 42687 19,788	31974 14108 17,866	52149 13969 38,180	68745 66296 2449
4.	50000 26245 23,755	71098 53474 17,624	83537 25768 57,769	42496 27399 15,097

Multiplication Test

Copy and multiply: Time: 4 min. after copying.

5.	3675 84 308,700	2491 37 92,167	1857 92 170,844	7308 16 116,928	2469 45 111,105

Division Test

Copy and divide: Time: 8 min. after copying.

6.	328 R32 64)21024	825 25)20625	749 R11 19)14242	189 76)14364
7.	496 83)41168	270 R10 37)10000	607 52)31564	551 48)26448

After noting improvements and/or deficiencies on progress cards, return papers to pupils so they may find and correct errors.

Provide comprehensive review of concepts and skills.

Problems and Practice

1. At \$2.75 apiece, find the cost of 350 books. \$962.50
2. At 24 for \$93.36, find the cost of 1 sweater. \$3.89
3. How much will $\frac{3}{4}$ lb. of candy cost at \$1.20 a pound? \$.90
4. What is the shape of a man's handkerchief? Square
5. Find the area (1) and perimeter (2) of a square 15″ by 15″. (1) 225 sq. in.; (2) 60″

Multiply. Check your work by going over it:

6. $\frac{7}{8}$ of 48 42 $\frac{2}{3} \times 75$ 50 $2\frac{1}{3} \times 60$ 140 $3\frac{2}{5} \times 25$ 85

7. $\frac{3}{4}$ of 60 45 $\frac{5}{6} \times 84$ 70 $4\frac{3}{8} \times 32$ 140 $4\frac{3}{4} \times 76$ 361

8. In the last 6 months Jim saved these amounts: Dec., \$.75; Jan., \$1.35; Feb., \$1.75; Mar., \$2.50; Apr., \$2.25; May, \$3.10. Find the average amount Jim saved per month. \$1.95

9. A train travels 1178 mi. in 19 hr. What is the average speed, in miles per hour, of that train? 62 mi.

10. Mr. Hill wants to build a new sidewalk 3 ft. wide and 66 ft. long. Find the cost at \$2.95 per square yard. \$64.90

11. Mr. Brown has enough chicken wire to go around a chicken yard 22′ long by 10′ wide. Would that wire be enough to go around a square chicken yard 16′ on a side? (1) Which chicken yard would have the larger area? (2) (1) 64′, yes; (2) 22 x 10 = 220 sq. ft., 16 x 16 = 256 sq. ft., 16′ x 16′ has larger area.

Divide. Use the remainders to give fractions in the quotients:

12. $43\overline{)482}$ $11\frac{9}{43}$ $29\overline{)5026}$ $173\frac{9}{29}$ $51\overline{)4284}$ 84 $18\overline{)12672}$ 704 $22\overline{)11517}$ $523\frac{1}{2}$

13. $15\overline{)415}$ $27\frac{2}{3}$ $30\overline{)8460}$ 282 $46\overline{)4508}$ 98 $34\overline{)21322}$ $627\frac{2}{17}$ $83\overline{)81921}$ 987

14. $41\overline{)947}$ $23\frac{4}{41}$ $12\overline{)1536}$ 128 $88\overline{)8295}$ $94\frac{23}{88}$ $49\overline{)12397}$ 253 $44\overline{)34551}$ $785\frac{1}{4}$

15. $38\overline{)862}$ $22\frac{13}{19}$ $19\overline{)6645}$ $349\frac{14}{19}$ $25\overline{)2425}$ 97 $31\overline{)21328}$ 688 $37\overline{)13468}$ 364

16. Find the sum of $2\frac{3}{8}$, $4\frac{1}{16}$, and $1\frac{3}{4}$. $8\frac{3}{16}$ Subtract $3\frac{1}{2}$ from $5\frac{1}{3}$. $1\frac{5}{6}$

17. Find the sum of $1\frac{5}{12}$, $2\frac{2}{3}$, and $4\frac{1}{4}$. $8\frac{1}{3}$ Subtract $4\frac{3}{4}$ from $9\frac{1}{4}$. $4\frac{1}{2}$

After checking papers have volunteers put work on board so that pupils may discover reasons for their errors and discuss them.

A Problem Test

This is the last Problem Test. Try to get a score of 10.

1. Bill and his father set out 2000 cabbage plants. They put 35 plants in a row. How many rows were there? 57 R5, or 57 rows, 5 plants left over
2. Mr. Martin's best chocolate candy sells for $1.80 a pound. How much would you have to pay for 12 oz.? $1.35
3. Mary and Joe made these amounts on their chickens in four months: $3.75, $2.86, $3.32, and $4.75. How much, on the average, did they make a month? $3.67
4. Jim and Mark made a playroom in the basement of their house. The room is 37 ft. long and 29 ft. wide. How many square feet of floor space do they have? 1073
5. Mrs. Wood bought a live turkey that weighed $17\frac{1}{4}$ lb. When it was ready to cook it weighed only $14\frac{5}{8}$ lb. How many pounds of its weight were lost? $2\frac{5}{8}$
6. Jane wants a book that costs $4.00 when new. She can buy a used copy for $2.75. How much will Jane save by buying the used book? $1.25
7. Betsy got $5.00 for her birthday. She bought $3\frac{1}{2}$ yd. of cloth for a dress at $.88 a yard. How much money did she have left? $1.92
8. An airplane made a trip of 3750 mi. in 15 hr. About how many miles did it average per hour? 250
9. Mr. Chase sells pencils at 5¢ apiece. Last month he sold 20 boxes of pencils with 72 pencils in each box. How much did he get for all the pencils? 7200¢, or $72.00
10. Mrs. Reed paid $6.96 for an 8-pound roast. How much was that a pound? $.87

SCORE	0–5 You need help	6–7 Fair	8–9 Good	10 Excellent

Have pupils compare results of this test with previous ones, as noted on own charts. Discussion of problems will still be helpful at this time to reinforce pupils' skills in problem solving.

Provide diagnostic tests (pages 302–303) of skills taught, with page references.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Pages for that row.

					Practice Pages
Add and check:					
1.	3.9 4.6 7.1 15.6	1.47 6.53 4.19 12.19	0.56 0.84 0.99 2.39	35.77 46.64 34.85 117.26	236, 237
Subtract and check:					
2.	7.0 0.6 6.4	85.5 39.8 45.7	6.54 4.57 1.97	87.47 53.69 33.78	236, 237
Multiply and check:					
3.	641 273 174,993	925 609 563,325	837 580 485,460	1496 94 140,624	50, 66, 69
Divide and check. Write R before remainders:					
4.	23 34)782	41 55)2255	354 41)14514		84–86
5.	38 R10 22)846	56 R30 43)2438	678 62)42036		94, 95
6.	7 R27 35)272	76 25)1900	767 24)18408		100
7.	34 R9 19)655	44 R32 37)1660	756 R13 28)21181		154–157
8.	32 26)832	62 48)2976	876 27)23652		166–169
9.	30 R11 24)731	180 R5 36)6485	590 54)31860		171
10.	204 19)3876	307 R5 23)7066	907 85)77095		173
11.	56 R7 15)847	76 17)1292	975 13)12675		174, 175
12.	9 R31 35)346	99 R23 42)4181	996 R37 63)62785		178, 179

Results of these tests should be noted on progress cards to give summary of pupils' abilities. Urge pupils to make self-assignments from practice pages.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Pages for that row.

Add. Check the work by going over it:

						Practice Pages
1.	$1\frac{1}{5}$ $1\frac{3}{5}$ $2\frac{4}{5}$	$2\frac{5}{6}$ $3\frac{5}{6}$ $6\frac{2}{3}$	$1\frac{3}{16}$ $4\frac{5}{16}$ $5\frac{1}{2}$	$8\frac{7}{12}$ $2\frac{5}{12}$ 11	$3\frac{7}{10}$ $4\frac{9}{10}$ $8\frac{3}{5}$	117, 125
2.	$\frac{3}{8}$ $\frac{3}{4}$ $1\frac{1}{8}$	$2\frac{1}{6}$ $1\frac{2}{3}$ $3\frac{5}{6}$	$7\frac{5}{8}$ $2\frac{7}{16}$ $10\frac{1}{16}$	$4\frac{7}{10}$ $4\frac{1}{2}$ $9\frac{1}{5}$	$5\frac{3}{4}$ $3\frac{5}{12}$ $9\frac{1}{6}$	189–191
3.	$\frac{3}{8}$ $\frac{1}{8}$ $\frac{3}{8}$ $\frac{7}{8}$	$4\frac{2}{3}$ $1\frac{1}{2}$ $2\frac{5}{6}$ 9	$3\frac{1}{8}$ $5\frac{9}{16}$ $4\frac{3}{4}$ $13\frac{7}{16}$	$6\frac{7}{12}$ $\frac{2}{3}$ $5\frac{1}{2}$ $12\frac{3}{4}$	$1\frac{4}{5}$ $2\frac{7}{10}$ $8\frac{1}{2}$ 13	208

Subtract. Check the work by going over it:

4.	$\frac{7}{8}$ $\frac{1}{8}$ $\frac{3}{4}$	$6\frac{3}{4}$ $2\frac{1}{4}$ $4\frac{1}{2}$	$2\frac{7}{12}$ $1\frac{1}{12}$ $1\frac{1}{2}$	$7\frac{9}{10}$ $4\frac{1}{10}$ $3\frac{4}{5}$	$3\frac{15}{16}$ $1\frac{9}{16}$ $2\frac{3}{8}$	119, 120
5.	$\frac{7}{8}$ $\frac{1}{4}$ $\frac{5}{8}$	$9\frac{5}{6}$ $2\frac{1}{3}$ $7\frac{1}{2}$	$4\frac{7}{8}$ $3\frac{3}{16}$ $1\frac{11}{16}$	$6\frac{11}{12}$ $6\frac{2}{3}$ $\frac{1}{4}$	$5\frac{4}{5}$ $4\frac{3}{10}$ $1\frac{1}{2}$	195, 196
6.	1 $\frac{2}{3}$ $\frac{1}{3}$	6 $4\frac{3}{8}$ $1\frac{5}{8}$	$7\frac{1}{4}$ $2\frac{3}{4}$ $4\frac{1}{2}$	$5\frac{1}{10}$ $2\frac{7}{10}$ $2\frac{2}{5}$	$8\frac{3}{16}$ $4\frac{11}{16}$ $3\frac{1}{2}$	203–207
7.	$4\frac{1}{8}$ $2\frac{3}{4}$ $1\frac{3}{8}$	$7\frac{1}{4}$ $3\frac{1}{2}$ $3\frac{3}{4}$	$6\frac{1}{2}$ $1\frac{5}{6}$ $4\frac{2}{3}$	$8\frac{2}{3}$ $5\frac{11}{12}$ $2\frac{3}{4}$	$3\frac{1}{5}$ $2\frac{7}{10}$ $\frac{1}{2}$	214, 215

Multiply. Check the work by going over it:

8.	$\frac{2}{3}$ of 21 14	$\frac{4}{5}$ of 35 28	$\frac{3}{4}$ of 32 24	217
9.	$\frac{7}{8} \times 48$ 42	$\frac{5}{6} \times 36$ 30	$\frac{5}{8} \times 56$ 35	219
10.	$1\frac{3}{4} \times 36$ 63	$2\frac{1}{2} \times 24$ 60	$3\frac{3}{8} \times 72$ 243	220

Provide an end-of-year test on year's work.

Are You Ready for the Next Grade?

1. Give the answers to all the number facts on pages 5, 12, and 31 of this book.(1) Then use the facts on page 5 as multiplication facts and give the answers.(2) (1) See answers on those pages; (2) see answers for ex. 1, page 19, on G-15.

Add and check:

2. 5004	19439	97.33	$5\frac{}{12}$	$8\frac{3}{5}$
1677	60272	28.68	$4\frac{1}{2}$	$1\frac{1}{2}$
2295	4978	54.25	$6\frac{3}{4}$	$3\frac{9}{10}$
4836	31746	26.50		
13,812	116,435	206.76	$16\frac{5}{6}$	14

Subtract and check:

3. 3942	14800	631.8	$7\frac{3}{16}$	$9\frac{1}{4}$
1574	4957	363.4	$5\frac{3}{4}$	$2\frac{5}{12}$
2368	9843	268.4	$1\frac{7}{16}$	$6\frac{5}{6}$

Multiply. Check by going over the work:

4. 380 × 496 188,480 $\frac{7}{8}$ × 72 63 $1\frac{2}{3}$ × 60 100

5. 407 × 834 339,438 $\frac{4}{5}$ × 60 48 $4\frac{5}{8}$ × 64 296

Divide. Use any remainder to give a fraction in the quotient:

6. 32)6925 $216\frac{13}{32}$ 25)24475 979 19)\$130.15 \$6.85 46)\$201.02 \$4.37

7. Which room has the larger area, one that is 14 ft. by 18 ft.(1) or one that is 16 ft. by 16 ft.?(2) How much larger is it?(3) (1) 252 sq. ft.; (2) 256 sq. ft.; (3) 16 ft. by 16 ft. is 4 sq. ft. larger.

8. Jean bought $2\frac{1}{2}$ yd. of cotton cloth at \$.98 a yard. How much change did she get from \$5.00? \$2.55

9. Don practiced on his drum $\frac{3}{4}$ hr. on Monday, $1\frac{1}{4}$ hr. on Tuesday, and 1 hr. on Thursday. What was the average time he practiced a day for those three days? 1 hr.

10. The 33 children in Miss Black's room shared the cost of hiring a bus. They had to pay \$14.85 to hire it. What was each child's share of the cost? \$.45

11. Find the cost of 475 books at \$1.25 each. \$593.75

Use this page as diagnostic test to give summary of pupils' abilities on progress cards. Note improvements and/or deficiencies.

Present ready-reference page of tables of measure.

Tables of Measure

Linear Measure

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
$5\frac{1}{2}$ yards or $16\frac{1}{2}$ feet = 1 rod (rd.)
320 rods or 5280 feet = 1 mile (mi.)

Square Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards = 1 square rod (sq. rd.)
43,560 square feet = 1 acre (A.)
160 square rods = 1 acre
640 acres = 1 square mile (sq. mi.)

Measures of Weight

16 ounces (oz.) = 1 pound (lb.)
2000 pounds = 1 ton (T.)

Measures of Time

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
About 52 weeks = 1 year (yr.)
12 months or 365 days = 1 year
366 days = 1 leap year
10 years = 1 decade
100 years = 1 century

Liquid Measure

2 cups (c.) = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

Dry Measure

2 pints = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

Provide ready reference of basic addition, subtraction (page 307), multiplication (page 308), division facts (page 309).

The 100 Addition Facts

$\begin{array}{r}0\\0\\\hline 0\end{array}$	$\begin{array}{r}1\\0\\\hline 1\end{array}$	$\begin{array}{r}2\\0\\\hline 2\end{array}$	$\begin{array}{r}3\\0\\\hline 3\end{array}$	$\begin{array}{r}4\\0\\\hline 4\end{array}$	$\begin{array}{r}5\\0\\\hline 5\end{array}$	$\begin{array}{r}6\\0\\\hline 6\end{array}$	$\begin{array}{r}7\\0\\\hline 7\end{array}$	$\begin{array}{r}8\\0\\\hline 8\end{array}$	$\begin{array}{r}9\\0\\\hline 9\end{array}$
$\begin{array}{r}0\\1\\\hline 1\end{array}$	$\begin{array}{r}1\\1\\\hline 2\end{array}$	$\begin{array}{r}2\\1\\\hline 3\end{array}$	$\begin{array}{r}3\\1\\\hline 4\end{array}$	$\begin{array}{r}4\\1\\\hline 5\end{array}$	$\begin{array}{r}5\\1\\\hline 6\end{array}$	$\begin{array}{r}6\\1\\\hline 7\end{array}$	$\begin{array}{r}7\\1\\\hline 8\end{array}$	$\begin{array}{r}8\\1\\\hline 9\end{array}$	$\begin{array}{r}9\\1\\\hline 10\end{array}$
$\begin{array}{r}0\\2\\\hline 2\end{array}$	$\begin{array}{r}1\\2\\\hline 3\end{array}$	$\begin{array}{r}2\\2\\\hline 4\end{array}$	$\begin{array}{r}3\\2\\\hline 5\end{array}$	$\begin{array}{r}4\\2\\\hline 6\end{array}$	$\begin{array}{r}5\\2\\\hline 7\end{array}$	$\begin{array}{r}6\\2\\\hline 8\end{array}$	$\begin{array}{r}7\\2\\\hline 9\end{array}$	$\begin{array}{r}8\\2\\\hline 10\end{array}$	$\begin{array}{r}9\\2\\\hline 11\end{array}$
$\begin{array}{r}0\\3\\\hline 3\end{array}$	$\begin{array}{r}1\\3\\\hline 4\end{array}$	$\begin{array}{r}2\\3\\\hline 5\end{array}$	$\begin{array}{r}3\\3\\\hline 6\end{array}$	$\begin{array}{r}4\\3\\\hline 7\end{array}$	$\begin{array}{r}5\\3\\\hline 8\end{array}$	$\begin{array}{r}6\\3\\\hline 9\end{array}$	$\begin{array}{r}7\\3\\\hline 10\end{array}$	$\begin{array}{r}8\\3\\\hline 11\end{array}$	$\begin{array}{r}9\\3\\\hline 12\end{array}$
$\begin{array}{r}0\\4\\\hline 4\end{array}$	$\begin{array}{r}1\\4\\\hline 5\end{array}$	$\begin{array}{r}2\\4\\\hline 6\end{array}$	$\begin{array}{r}3\\4\\\hline 7\end{array}$	$\begin{array}{r}4\\4\\\hline 8\end{array}$	$\begin{array}{r}5\\4\\\hline 9\end{array}$	$\begin{array}{r}6\\4\\\hline 10\end{array}$	$\begin{array}{r}7\\4\\\hline 11\end{array}$	$\begin{array}{r}8\\4\\\hline 12\end{array}$	$\begin{array}{r}9\\4\\\hline 13\end{array}$
$\begin{array}{r}0\\5\\\hline 5\end{array}$	$\begin{array}{r}1\\5\\\hline 6\end{array}$	$\begin{array}{r}2\\5\\\hline 7\end{array}$	$\begin{array}{r}3\\5\\\hline 8\end{array}$	$\begin{array}{r}4\\5\\\hline 9\end{array}$	$\begin{array}{r}5\\5\\\hline 10\end{array}$	$\begin{array}{r}6\\5\\\hline 11\end{array}$	$\begin{array}{r}7\\5\\\hline 12\end{array}$	$\begin{array}{r}8\\5\\\hline 13\end{array}$	$\begin{array}{r}9\\5\\\hline 14\end{array}$
$\begin{array}{r}0\\6\\\hline 6\end{array}$	$\begin{array}{r}1\\6\\\hline 7\end{array}$	$\begin{array}{r}2\\6\\\hline 8\end{array}$	$\begin{array}{r}3\\6\\\hline 9\end{array}$	$\begin{array}{r}4\\6\\\hline 10\end{array}$	$\begin{array}{r}5\\6\\\hline 11\end{array}$	$\begin{array}{r}6\\6\\\hline 12\end{array}$	$\begin{array}{r}7\\6\\\hline 13\end{array}$	$\begin{array}{r}8\\6\\\hline 14\end{array}$	$\begin{array}{r}9\\6\\\hline 15\end{array}$
$\begin{array}{r}0\\7\\\hline 7\end{array}$	$\begin{array}{r}1\\7\\\hline 8\end{array}$	$\begin{array}{r}2\\7\\\hline 9\end{array}$	$\begin{array}{r}3\\7\\\hline 10\end{array}$	$\begin{array}{r}4\\7\\\hline 11\end{array}$	$\begin{array}{r}5\\7\\\hline 12\end{array}$	$\begin{array}{r}6\\7\\\hline 13\end{array}$	$\begin{array}{r}7\\7\\\hline 14\end{array}$	$\begin{array}{r}8\\7\\\hline 15\end{array}$	$\begin{array}{r}9\\7\\\hline 16\end{array}$
$\begin{array}{r}0\\8\\\hline 8\end{array}$	$\begin{array}{r}1\\8\\\hline 9\end{array}$	$\begin{array}{r}2\\8\\\hline 10\end{array}$	$\begin{array}{r}3\\8\\\hline 11\end{array}$	$\begin{array}{r}4\\8\\\hline 12\end{array}$	$\begin{array}{r}5\\8\\\hline 13\end{array}$	$\begin{array}{r}6\\8\\\hline 14\end{array}$	$\begin{array}{r}7\\8\\\hline 15\end{array}$	$\begin{array}{r}8\\8\\\hline 16\end{array}$	$\begin{array}{r}9\\8\\\hline 17\end{array}$
$\begin{array}{r}0\\9\\\hline 9\end{array}$	$\begin{array}{r}1\\9\\\hline 10\end{array}$	$\begin{array}{r}2\\9\\\hline 11\end{array}$	$\begin{array}{r}3\\9\\\hline 12\end{array}$	$\begin{array}{r}4\\9\\\hline 13\end{array}$	$\begin{array}{r}5\\9\\\hline 14\end{array}$	$\begin{array}{r}6\\9\\\hline 15\end{array}$	$\begin{array}{r}7\\9\\\hline 16\end{array}$	$\begin{array}{r}8\\9\\\hline 17\end{array}$	$\begin{array}{r}9\\9\\\hline 18\end{array}$

Facts are listed in sequential order so that pupils may see relationships which exist between them. Be sure to point out these relationships.

The 100 Subtraction Facts

$\begin{array}{r}0\\0\\\hline 0\end{array}$	$\begin{array}{r}1\\0\\\hline 1\end{array}$	$\begin{array}{r}2\\0\\\hline 2\end{array}$	$\begin{array}{r}3\\0\\\hline 3\end{array}$	$\begin{array}{r}4\\0\\\hline 4\end{array}$	$\begin{array}{r}5\\0\\\hline 5\end{array}$	$\begin{array}{r}6\\0\\\hline 6\end{array}$	$\begin{array}{r}7\\0\\\hline 7\end{array}$	$\begin{array}{r}8\\0\\\hline 8\end{array}$	$\begin{array}{r}9\\0\\\hline 9\end{array}$
$\begin{array}{r}1\\1\\\hline 0\end{array}$	$\begin{array}{r}2\\1\\\hline 1\end{array}$	$\begin{array}{r}3\\1\\\hline 2\end{array}$	$\begin{array}{r}4\\1\\\hline 3\end{array}$	$\begin{array}{r}5\\1\\\hline 4\end{array}$	$\begin{array}{r}6\\1\\\hline 5\end{array}$	$\begin{array}{r}7\\1\\\hline 6\end{array}$	$\begin{array}{r}8\\1\\\hline 7\end{array}$	$\begin{array}{r}9\\1\\\hline 8\end{array}$	$\begin{array}{r}10\\1\\\hline 9\end{array}$
$\begin{array}{r}2\\2\\\hline 0\end{array}$	$\begin{array}{r}3\\2\\\hline 1\end{array}$	$\begin{array}{r}4\\2\\\hline 2\end{array}$	$\begin{array}{r}5\\2\\\hline 3\end{array}$	$\begin{array}{r}6\\2\\\hline 4\end{array}$	$\begin{array}{r}7\\2\\\hline 5\end{array}$	$\begin{array}{r}8\\2\\\hline 6\end{array}$	$\begin{array}{r}9\\2\\\hline 7\end{array}$	$\begin{array}{r}10\\2\\\hline 8\end{array}$	$\begin{array}{r}11\\2\\\hline 9\end{array}$
$\begin{array}{r}3\\3\\\hline 0\end{array}$	$\begin{array}{r}4\\3\\\hline 1\end{array}$	$\begin{array}{r}5\\3\\\hline 2\end{array}$	$\begin{array}{r}6\\3\\\hline 3\end{array}$	$\begin{array}{r}7\\3\\\hline 4\end{array}$	$\begin{array}{r}8\\3\\\hline 5\end{array}$	$\begin{array}{r}9\\3\\\hline 6\end{array}$	$\begin{array}{r}10\\3\\\hline 7\end{array}$	$\begin{array}{r}11\\3\\\hline 8\end{array}$	$\begin{array}{r}12\\3\\\hline 9\end{array}$
$\begin{array}{r}4\\4\\\hline 0\end{array}$	$\begin{array}{r}5\\4\\\hline 1\end{array}$	$\begin{array}{r}6\\4\\\hline 2\end{array}$	$\begin{array}{r}7\\4\\\hline 3\end{array}$	$\begin{array}{r}8\\4\\\hline 4\end{array}$	$\begin{array}{r}9\\4\\\hline 5\end{array}$	$\begin{array}{r}10\\4\\\hline 6\end{array}$	$\begin{array}{r}11\\4\\\hline 7\end{array}$	$\begin{array}{r}12\\4\\\hline 8\end{array}$	$\begin{array}{r}13\\4\\\hline 9\end{array}$
$\begin{array}{r}5\\5\\\hline 0\end{array}$	$\begin{array}{r}6\\5\\\hline 1\end{array}$	$\begin{array}{r}7\\5\\\hline 2\end{array}$	$\begin{array}{r}8\\5\\\hline 3\end{array}$	$\begin{array}{r}9\\5\\\hline 4\end{array}$	$\begin{array}{r}10\\5\\\hline 5\end{array}$	$\begin{array}{r}11\\5\\\hline 6\end{array}$	$\begin{array}{r}12\\5\\\hline 7\end{array}$	$\begin{array}{r}13\\5\\\hline 8\end{array}$	$\begin{array}{r}14\\5\\\hline 9\end{array}$
$\begin{array}{r}6\\6\\\hline 0\end{array}$	$\begin{array}{r}7\\6\\\hline 1\end{array}$	$\begin{array}{r}8\\6\\\hline 2\end{array}$	$\begin{array}{r}9\\6\\\hline 3\end{array}$	$\begin{array}{r}10\\6\\\hline 4\end{array}$	$\begin{array}{r}11\\6\\\hline 5\end{array}$	$\begin{array}{r}12\\6\\\hline 6\end{array}$	$\begin{array}{r}13\\6\\\hline 7\end{array}$	$\begin{array}{r}14\\6\\\hline 8\end{array}$	$\begin{array}{r}15\\6\\\hline 9\end{array}$
$\begin{array}{r}7\\7\\\hline 0\end{array}$	$\begin{array}{r}8\\7\\\hline 1\end{array}$	$\begin{array}{r}9\\7\\\hline 2\end{array}$	$\begin{array}{r}10\\7\\\hline 3\end{array}$	$\begin{array}{r}11\\7\\\hline 4\end{array}$	$\begin{array}{r}12\\7\\\hline 5\end{array}$	$\begin{array}{r}13\\7\\\hline 6\end{array}$	$\begin{array}{r}14\\7\\\hline 7\end{array}$	$\begin{array}{r}15\\7\\\hline 8\end{array}$	$\begin{array}{r}16\\7\\\hline 9\end{array}$
$\begin{array}{r}8\\8\\\hline 0\end{array}$	$\begin{array}{r}9\\8\\\hline 1\end{array}$	$\begin{array}{r}10\\8\\\hline 2\end{array}$	$\begin{array}{r}11\\8\\\hline 3\end{array}$	$\begin{array}{r}12\\8\\\hline 4\end{array}$	$\begin{array}{r}13\\8\\\hline 5\end{array}$	$\begin{array}{r}14\\8\\\hline 6\end{array}$	$\begin{array}{r}15\\8\\\hline 7\end{array}$	$\begin{array}{r}16\\8\\\hline 8\end{array}$	$\begin{array}{r}17\\8\\\hline 9\end{array}$
$\begin{array}{r}9\\9\\\hline 0\end{array}$	$\begin{array}{r}10\\9\\\hline 1\end{array}$	$\begin{array}{r}11\\9\\\hline 2\end{array}$	$\begin{array}{r}12\\9\\\hline 3\end{array}$	$\begin{array}{r}13\\9\\\hline 4\end{array}$	$\begin{array}{r}14\\9\\\hline 5\end{array}$	$\begin{array}{r}15\\9\\\hline 6\end{array}$	$\begin{array}{r}16\\9\\\hline 7\end{array}$	$\begin{array}{r}17\\9\\\hline 8\end{array}$	$\begin{array}{r}18\\9\\\hline 9\end{array}$

The 100 Multiplication Facts

$\begin{array}{r}0\\0\\\hline 0\end{array}$	$\begin{array}{r}1\\0\\\hline 0\end{array}$	$\begin{array}{r}2\\0\\\hline 0\end{array}$	$\begin{array}{r}3\\0\\\hline 0\end{array}$	$\begin{array}{r}4\\0\\\hline 0\end{array}$	$\begin{array}{r}5\\0\\\hline 0\end{array}$	$\begin{array}{r}6\\0\\\hline 0\end{array}$	$\begin{array}{r}7\\0\\\hline 0\end{array}$	$\begin{array}{r}8\\0\\\hline 0\end{array}$	$\begin{array}{r}9\\0\\\hline 0\end{array}$
$\begin{array}{r}0\\1\\\hline 0\end{array}$	$\begin{array}{r}1\\1\\\hline 1\end{array}$	$\begin{array}{r}2\\1\\\hline 2\end{array}$	$\begin{array}{r}3\\1\\\hline 3\end{array}$	$\begin{array}{r}4\\1\\\hline 4\end{array}$	$\begin{array}{r}5\\1\\\hline 5\end{array}$	$\begin{array}{r}6\\1\\\hline 6\end{array}$	$\begin{array}{r}7\\1\\\hline 7\end{array}$	$\begin{array}{r}8\\1\\\hline 8\end{array}$	$\begin{array}{r}9\\1\\\hline 9\end{array}$
$\begin{array}{r}0\\2\\\hline 0\end{array}$	$\begin{array}{r}1\\2\\\hline 2\end{array}$	$\begin{array}{r}2\\2\\\hline 4\end{array}$	$\begin{array}{r}3\\2\\\hline 6\end{array}$	$\begin{array}{r}4\\2\\\hline 8\end{array}$	$\begin{array}{r}5\\2\\\hline 10\end{array}$	$\begin{array}{r}6\\2\\\hline 12\end{array}$	$\begin{array}{r}7\\2\\\hline 14\end{array}$	$\begin{array}{r}8\\2\\\hline 16\end{array}$	$\begin{array}{r}9\\2\\\hline 18\end{array}$
$\begin{array}{r}0\\3\\\hline 0\end{array}$	$\begin{array}{r}1\\3\\\hline 3\end{array}$	$\begin{array}{r}2\\3\\\hline 6\end{array}$	$\begin{array}{r}3\\3\\\hline 9\end{array}$	$\begin{array}{r}4\\3\\\hline 12\end{array}$	$\begin{array}{r}5\\3\\\hline 15\end{array}$	$\begin{array}{r}6\\3\\\hline 18\end{array}$	$\begin{array}{r}7\\3\\\hline 21\end{array}$	$\begin{array}{r}8\\3\\\hline 24\end{array}$	$\begin{array}{r}9\\3\\\hline 27\end{array}$
$\begin{array}{r}0\\4\\\hline 0\end{array}$	$\begin{array}{r}1\\4\\\hline 4\end{array}$	$\begin{array}{r}2\\4\\\hline 8\end{array}$	$\begin{array}{r}3\\4\\\hline 12\end{array}$	$\begin{array}{r}4\\4\\\hline 16\end{array}$	$\begin{array}{r}5\\4\\\hline 20\end{array}$	$\begin{array}{r}6\\4\\\hline 24\end{array}$	$\begin{array}{r}7\\4\\\hline 28\end{array}$	$\begin{array}{r}8\\4\\\hline 32\end{array}$	$\begin{array}{r}9\\4\\\hline 36\end{array}$
$\begin{array}{r}0\\5\\\hline 0\end{array}$	$\begin{array}{r}1\\5\\\hline 5\end{array}$	$\begin{array}{r}2\\5\\\hline 10\end{array}$	$\begin{array}{r}3\\5\\\hline 15\end{array}$	$\begin{array}{r}4\\5\\\hline 20\end{array}$	$\begin{array}{r}5\\5\\\hline 25\end{array}$	$\begin{array}{r}6\\5\\\hline 30\end{array}$	$\begin{array}{r}7\\5\\\hline 35\end{array}$	$\begin{array}{r}8\\5\\\hline 40\end{array}$	$\begin{array}{r}9\\5\\\hline 45\end{array}$
$\begin{array}{r}0\\6\\\hline 0\end{array}$	$\begin{array}{r}1\\6\\\hline 6\end{array}$	$\begin{array}{r}2\\6\\\hline 12\end{array}$	$\begin{array}{r}3\\6\\\hline 18\end{array}$	$\begin{array}{r}4\\6\\\hline 24\end{array}$	$\begin{array}{r}5\\6\\\hline 30\end{array}$	$\begin{array}{r}6\\6\\\hline 36\end{array}$	$\begin{array}{r}7\\6\\\hline 42\end{array}$	$\begin{array}{r}8\\6\\\hline 48\end{array}$	$\begin{array}{r}9\\6\\\hline 54\end{array}$
$\begin{array}{r}0\\7\\\hline 0\end{array}$	$\begin{array}{r}1\\7\\\hline 7\end{array}$	$\begin{array}{r}2\\7\\\hline 14\end{array}$	$\begin{array}{r}3\\7\\\hline 21\end{array}$	$\begin{array}{r}4\\7\\\hline 28\end{array}$	$\begin{array}{r}5\\7\\\hline 35\end{array}$	$\begin{array}{r}6\\7\\\hline 42\end{array}$	$\begin{array}{r}7\\7\\\hline 49\end{array}$	$\begin{array}{r}8\\7\\\hline 56\end{array}$	$\begin{array}{r}9\\7\\\hline 63\end{array}$
$\begin{array}{r}0\\8\\\hline 0\end{array}$	$\begin{array}{r}1\\8\\\hline 8\end{array}$	$\begin{array}{r}2\\8\\\hline 16\end{array}$	$\begin{array}{r}3\\8\\\hline 24\end{array}$	$\begin{array}{r}4\\8\\\hline 32\end{array}$	$\begin{array}{r}5\\8\\\hline 40\end{array}$	$\begin{array}{r}6\\8\\\hline 48\end{array}$	$\begin{array}{r}7\\8\\\hline 56\end{array}$	$\begin{array}{r}8\\8\\\hline 64\end{array}$	$\begin{array}{r}9\\8\\\hline 72\end{array}$
$\begin{array}{r}0\\9\\\hline 0\end{array}$	$\begin{array}{r}1\\9\\\hline 9\end{array}$	$\begin{array}{r}2\\9\\\hline 18\end{array}$	$\begin{array}{r}3\\9\\\hline 27\end{array}$	$\begin{array}{r}4\\9\\\hline 36\end{array}$	$\begin{array}{r}5\\9\\\hline 45\end{array}$	$\begin{array}{r}6\\9\\\hline 54\end{array}$	$\begin{array}{r}7\\9\\\hline 63\end{array}$	$\begin{array}{r}8\\9\\\hline 72\end{array}$	$\begin{array}{r}9\\9\\\hline 81\end{array}$

The 90 Division Facts

$\begin{array}{r}1\\ 1\overline{)1}\end{array}$	$\begin{array}{r}2\\ 1\overline{)2}\end{array}$	$\begin{array}{r}3\\ 1\overline{)3}\end{array}$	$\begin{array}{r}4\\ 1\overline{)4}\end{array}$	$\begin{array}{r}5\\ 1\overline{)5}\end{array}$	$\begin{array}{r}6\\ 1\overline{)6}\end{array}$	$\begin{array}{r}7\\ 1\overline{)7}\end{array}$	$\begin{array}{r}8\\ 1\overline{)8}\end{array}$	$\begin{array}{r}9\\ 1\overline{)9}\end{array}$
$\begin{array}{r}1\\ 2\overline{)2}\end{array}$	$\begin{array}{r}2\\ 2\overline{)4}\end{array}$	$\begin{array}{r}3\\ 2\overline{)6}\end{array}$	$\begin{array}{r}4\\ 2\overline{)8}\end{array}$	$\begin{array}{r}5\\ 2\overline{)10}\end{array}$	$\begin{array}{r}6\\ 2\overline{)12}\end{array}$	$\begin{array}{r}7\\ 2\overline{)14}\end{array}$	$\begin{array}{r}8\\ 2\overline{)16}\end{array}$	$\begin{array}{r}9\\ 2\overline{)18}\end{array}$
$\begin{array}{r}1\\ 3\overline{)3}\end{array}$	$\begin{array}{r}2\\ 3\overline{)6}\end{array}$	$\begin{array}{r}3\\ 3\overline{)9}\end{array}$	$\begin{array}{r}4\\ 3\overline{)12}\end{array}$	$\begin{array}{r}5\\ 3\overline{)15}\end{array}$	$\begin{array}{r}6\\ 3\overline{)18}\end{array}$	$\begin{array}{r}7\\ 3\overline{)21}\end{array}$	$\begin{array}{r}8\\ 3\overline{)24}\end{array}$	$\begin{array}{r}9\\ 3\overline{)27}\end{array}$
$\begin{array}{r}1\\ 4\overline{)4}\end{array}$	$\begin{array}{r}2\\ 4\overline{)8}\end{array}$	$\begin{array}{r}3\\ 4\overline{)12}\end{array}$	$\begin{array}{r}4\\ 4\overline{)16}\end{array}$	$\begin{array}{r}5\\ 4\overline{)20}\end{array}$	$\begin{array}{r}6\\ 4\overline{)24}\end{array}$	$\begin{array}{r}7\\ 4\overline{)28}\end{array}$	$\begin{array}{r}8\\ 4\overline{)32}\end{array}$	$\begin{array}{r}9\\ 4\overline{)36}\end{array}$
$\begin{array}{r}1\\ 5\overline{)5}\end{array}$	$\begin{array}{r}2\\ 5\overline{)10}\end{array}$	$\begin{array}{r}3\\ 5\overline{)15}\end{array}$	$\begin{array}{r}4\\ 5\overline{)20}\end{array}$	$\begin{array}{r}5\\ 5\overline{)25}\end{array}$	$\begin{array}{r}6\\ 5\overline{)30}\end{array}$	$\begin{array}{r}7\\ 5\overline{)35}\end{array}$	$\begin{array}{r}8\\ 5\overline{)40}\end{array}$	$\begin{array}{r}9\\ 5\overline{)45}\end{array}$
$\begin{array}{r}1\\ 6\overline{)6}\end{array}$	$\begin{array}{r}2\\ 6\overline{)12}\end{array}$	$\begin{array}{r}3\\ 6\overline{)18}\end{array}$	$\begin{array}{r}4\\ 6\overline{)24}\end{array}$	$\begin{array}{r}5\\ 6\overline{)30}\end{array}$	$\begin{array}{r}6\\ 6\overline{)36}\end{array}$	$\begin{array}{r}7\\ 6\overline{)42}\end{array}$	$\begin{array}{r}8\\ 6\overline{)48}\end{array}$	$\begin{array}{r}9\\ 6\overline{)54}\end{array}$
$\begin{array}{r}1\\ 7\overline{)7}\end{array}$	$\begin{array}{r}2\\ 7\overline{)14}\end{array}$	$\begin{array}{r}3\\ 7\overline{)21}\end{array}$	$\begin{array}{r}4\\ 7\overline{)28}\end{array}$	$\begin{array}{r}5\\ 7\overline{)35}\end{array}$	$\begin{array}{r}6\\ 7\overline{)42}\end{array}$	$\begin{array}{r}7\\ 7\overline{)49}\end{array}$	$\begin{array}{r}8\\ 7\overline{)56}\end{array}$	$\begin{array}{r}9\\ 7\overline{)63}\end{array}$
$\begin{array}{r}1\\ 8\overline{)8}\end{array}$	$\begin{array}{r}2\\ 8\overline{)16}\end{array}$	$\begin{array}{r}3\\ 8\overline{)24}\end{array}$	$\begin{array}{r}4\\ 8\overline{)32}\end{array}$	$\begin{array}{r}5\\ 8\overline{)40}\end{array}$	$\begin{array}{r}6\\ 8\overline{)48}\end{array}$	$\begin{array}{r}7\\ 8\overline{)56}\end{array}$	$\begin{array}{r}8\\ 8\overline{)64}\end{array}$	$\begin{array}{r}9\\ 8\overline{)72}\end{array}$
$\begin{array}{r}1\\ 9\overline{)9}\end{array}$	$\begin{array}{r}2\\ 9\overline{)18}\end{array}$	$\begin{array}{r}3\\ 9\overline{)27}\end{array}$	$\begin{array}{r}4\\ 9\overline{)36}\end{array}$	$\begin{array}{r}5\\ 9\overline{)45}\end{array}$	$\begin{array}{r}6\\ 9\overline{)54}\end{array}$	$\begin{array}{r}7\\ 9\overline{)63}\end{array}$	$\begin{array}{r}8\\ 9\overline{)72}\end{array}$	$\begin{array}{r}9\\ 9\overline{)81}\end{array}$
$\begin{array}{r}0\\ 1\overline{)0}\end{array}$	$\begin{array}{r}0\\ 2\overline{)0}\end{array}$	$\begin{array}{r}0\\ 3\overline{)0}\end{array}$	$\begin{array}{r}0\\ 4\overline{)0}\end{array}$	$\begin{array}{r}0\\ 5\overline{)0}\end{array}$	$\begin{array}{r}0\\ 6\overline{)0}\end{array}$	$\begin{array}{r}0\\ 7\overline{)0}\end{array}$	$\begin{array}{r}0\\ 8\overline{)0}\end{array}$	$\begin{array}{r}0\\ 9\overline{)0}\end{array}$

Pages 310–326 provide supplementary practice material in all skills taught or retaught in Grade 5.

More Practice

①

1. 24 + 5 29 32 + 4 36 51 + 8 59 93 + 4 97 44 + 2 46

2. 63 + 7 70 28 + 2 30 74 + 6 80 35 + 5 40 71 + 9 80

3. 47 + 8 55 36 + 5 41 83 + 9 92 26 + 8 34 57 + 6 63

4. 19 + 7 26 68 + 8 76 44 + 8 52 72 + 9 81 85 + 7 92

5.	73	47	84	45	596	670	397	942
	83	76	37	68	157	298	284	294
	66	53	95	76	806	533	468	258
	+86	+78	+54	+47	+265	+499	+506	+347
	308	254	270	236	1824	2000	1655	1841
6.	81	70	84	57	331	689	968	233
	17	12	36	31	997	682	187	894
	55	65	90	88	253	776	567	932
	92	50	41	72	614	519	959	843
	+13	+39	+64	+58	+878	+407	+549	+624
	258	236	315	306	3073	3073	3230	3526

②

7. 39 − 6 33 54 − 4 50 87 − 5 82 66 − 3 63 28 − 5 23

8. 50 − 5 45 80 − 3 77 90 − 7 83 60 − 4 56 30 − 8 22

9. 92 − 8 84 64 − 9 55 23 − 6 17 31 − 8 23 26 − 7 19

10. 41 − 5 36 75 − 8 67 56 − 8 48 80 − 7 73 37 − 9 28

11.	498	291	734	1547	8423	5328	4000
	−367	−259	−486	−1289	−4634	−1658	−2144
	131	32	248	258	3789	3670	1856
12.	188	800	604	8462	9241	7225	7132
	−96	−579	−425	−6803	−4556	−6429	−2248
	92	221	179	1659	4685	796	4884
13.	800	160	513	5626	1234	7000	8976
	−757	−65	−483	−5279	−999	−3873	−1278
	43	95	30	347	235	3127	7698
14.	950	645	700	3867	8000	8344	6002
	−358	−398	−536	−1278	−3591	−1777	−1843
	592	247	164	2589	4409	6567	4159

These pages are correlated with ones throughout the text. Use for individual pupil assistance, review and reinforcement of processes, reteaching, and so on.

More Practice

③

1.	3R2 8)26	2R4 5)14	5R5 7)40	8R2 3)26	7R3 9)66	3R4 6)22	9R6 9)87
2.	7R5 6)47	4R3 9)39	8R5 6)53	4R4 7)32	7R3 4)31	8R6 8)70	6R3 5)33
3.	5R5 9)50	3R7 8)31	4R4 6)28	3R7 9)34	6R4 8)52	3R2 5)17	9R5 7)68
4.	5R3 5)28	4R2 8)34	2R5 7)19	7R7 9)70	4R2 3)14	9R5 6)59	4R5 9)41
5.	6R1 4)25	3R3 7)24	5R7 9)52	6R3 6)39	7R5 8)61	8R4 5)44	1R5 6)11
6.	7R5 9)68	7R4 8)60	5R5 6)35	3R4 5)19	2R5 9)23	6R5 7)47	6R6 8)54
7.	6R6 7)48	7R6 8)62	7R3 5)38	5R4 8)44	4R3 5)23	8R2 6)50	1R5 9)14
8.	1R7 8)15	3R3 6)21	6R7 9)61	3R2 4)14	7R1 7)50	6R3 9)57	5R1 5)26
9.	9R2 3)29	2R6 7)20	9R4 5)49	3R6 8)30	7R5 7)54	8R8 9)80	6R5 6)41

④

10.	653 ×9 5877	782 ×4 3128	967 ×2 1934	720 ×7 5040	4796 ×8 38,368	3175 ×6 19,050
11.	584 ×3 1752	408 ×6 2448	580 ×8 4640	269 ×5 1345	6394 ×4 25,576	5368 ×7 37,576
12.	875 ×5 4375	312 ×8 2496	149 ×7 1043	827 ×9 7443	9167 ×3 27,501	1094 ×9 9846
13.	134 4)536	143R5 6)863	715 9)6435	483 8)3864	658R1 3)1975	670R5 7)4695
14.	387R1 2)775	195 5)975	934 7)6538	752 6)4512	529R5 8)4237	496R1 9)4465
15.	209 3)627	240R3 4)963	167 8)1336	896R4 6)5380	283 9)2547	852 7)5964
16.	235 4)940	120R4 7)844	956 2)1912	438 9)3942	658 8)5264	807R3 5)4038

More Practice

⑤

1. 35 × 2647 92,645 59 × 2416 142,544 19 × 2493 47,367
2. 76 × 1985 150,860 37 × 7320 270,840 44 × 1045 45,980
3. 43 × 3109 133,687 69 × 5706 393,714 73 × 5184 378,432
4. 61 × 4723 288,103 87 × 6498 565,326 92 × 2962 272,504
5. 84 × 6275 527,100 16 × 5168 82,688 38 × 8569 325,622
6. 28 × 1430 40,040 81 × 3209 259,929 27 × 2036 54,972
7. 95 × 8039 763,705 98 × 7518 736,764 64 × 3762 240,768
8. 52 × 1587 82,524 46 × 2984 137,264 75 × 5937 445,275

⑥

9. 60 × 19 1140 90 × 31 2790 700 × 80 56,000 200 × 93 18,600
10. 30 × 84 2520 50 × 46 2300 400 × 68 27,200 800 × 72 57,600
11. 70 × 47 3290 10 × 78 780 900 × 94 84,600 500 × 81 40,500
12. 90 × 73 6570 40 × 90 3600 600 × 36 21,600 100 × 49 4,900
13. 20 × 65 1300 80 × 25 2000 300 × 52 15,600 400 × 57 22,800

⑦

14. 51 × 84 4284 425 × 819 348,075 257 × 275 70,675 589 × 673 396,397
15. 63 × 65 4095 624 × 735 458,640 569 × 625 355,625 215 × 197 42,355
16. 49 × 93 4557 397 × 458 181,826 672 × 814 547,008 684 × 711 486,324
17. 72 × 62 4464 183 × 295 53,985 314 × 327 102,678 391 × 512 200,192
18. 98 × 75 7350 517 × 657 339,669 498 × 654 325,692 847 × 648 548,856
19. 34 × 90 3060 186 × 186 34,596 836 × 436 364,496 936 × 872 816,192
20. 16 × 84 1344 739 × 913 674,707 671 × 923 619,333 125 × 435 54,375
21. 25 × 38 950 352 × 426 149,952 725 × 938 680,050 893 × 926 826,918
22. 87 × 71 6177 968 × 997 965,096 418 × 812 339,416 764 × 659 503,476
23. 59 × 64 3776 241 × 643 154,963 943 × 718 677,074 572 × 921 526,812

⑧

1.	502 × 736	369,472	620 × 842	522,040	380 × 562	213,560
2.	860 × 917	788,620	705 × 712	501,960	510 × 609	310,590
3.	160 × 358	57,280	405 × 895	362,475	920 × 950	874,000
4.	908 × 842	764,536	840 × 630	529,200	701 × 702	492,102
5.	960 × 609	584,640	607 × 563	341,741	907 × 418	379,126
6.	309 × 735	227,115	540 × 741	400,140	403 × 120	48,360
7.	730 × 894	652,620	206 × 519	106,914	809 × 763	617,267

⑨

8.	84 ÷ 42	2	115 ÷ 23	5	297 ÷ 33	9	224 ÷ 32	7
9.	88 ÷ 22	4	136 ÷ 34	4	204 ÷ 34	6	168 ÷ 21	8
10.	89 ÷ 43	2R3	220 ÷ 44	5	198 ÷ 22	9	327 ÷ 40	8R7
11.	96 ÷ 24	4	231 ÷ 33	7	336 ÷ 42	8	165 ÷ 33	5
12.	95 ÷ 23	4R3	135 ÷ 22	6R3	238 ÷ 34	7	328 ÷ 41	8
13.	78 ÷ 25	3R3	260 ÷ 43	6R2	265 ÷ 33	8R1	163 ÷ 32	5R3
14.	75 ÷ 34	2R7	147 ÷ 20	7R7	387 ÷ 43	9	279 ÷ 31	9
15.	69 ÷ 23	3	215 ÷ 42	5R5	396 ÷ 44	9	199 ÷ 30	6R1

⑩

16.	989 ÷ 23	43	1190 ÷ 35	34	2976 ÷ 32	93	2268 ÷ 42	54
17.	960 ÷ 30	32	2772 ÷ 44	63	1161 ÷ 43	27	1386 ÷ 22	63
18.	735 ÷ 21	35	2542 ÷ 31	82	1170 ÷ 45	26	1768 ÷ 34	52
19.	792 ÷ 24	33	2226 ÷ 42	53	1680 ÷ 20	84	2201 ÷ 31	71
20.	946 ÷ 22	43	2583 ÷ 41	63	1953 ÷ 21	93	1470 ÷ 35	42
21.	961 ÷ 31	31	2079 ÷ 33	63	2288 ÷ 44	52	2336 ÷ 32	73
22.	792 ÷ 33	24	1530 ÷ 45	34	2074 ÷ 34	61	2173 ÷ 41	53
23.	775 ÷ 25	31	1505 ÷ 43	35	2960 ÷ 40	74	2376 ÷ 33	72

More Practice

⑪ ……

1. 801 ÷ 22 36R9 2131 ÷ 34 62R23 1880 ÷ 23 81R17 3638 ÷ 63 57R47
2. 925 ÷ 25 37 3221 ÷ 42 76R29 1960 ÷ 35 56 2561 ÷ 44 58R9
3. 910 ÷ 35 26 1601 ÷ 22 72R17 2411 ÷ 45 53R26 1581 ÷ 25 63R6
4. 817 ÷ 23 35R12 2572 ÷ 35 73R17 3630 ÷ 53 68R26 2515 ÷ 54 46R31
5. 821 ÷ 24 34R5 1441 ÷ 21 68R13 4220 ÷ 65 64R60 2820 ÷ 41 68R32
6. 911 ÷ 34 26R27 1175 ÷ 25 47 1003 ÷ 22 45R13 2745 ÷ 32 85R25
7. 414 ÷ 23 18 2809 ÷ 44 63R37 3650 ÷ 43 84R38 1571 ÷ 24 65R11

⑫ ……

Change to lowest terms:

8. $\frac{4}{16}$ $\frac{1}{4}$ $\frac{8}{20}$ $\frac{2}{5}$ $\frac{2}{10}$ $\frac{1}{5}$ $\frac{3}{15}$ $\frac{1}{5}$ $\frac{16}{20}$ $\frac{4}{5}$ $\frac{2}{16}$ $\frac{1}{8}$ $\frac{4}{32}$ $\frac{1}{8}$ $\frac{10}{15}$ $\frac{2}{3}$ $\frac{5}{20}$ $\frac{1}{4}$
9. $\frac{4}{20}$ $\frac{1}{5}$ $\frac{9}{12}$ $\frac{3}{4}$ $\frac{12}{32}$ $\frac{3}{8}$ $\frac{8}{16}$ $\frac{1}{2}$ $\frac{8}{10}$ $\frac{4}{5}$ $\frac{24}{32}$ $\frac{3}{4}$ $\frac{5}{15}$ $\frac{1}{3}$ $\frac{18}{20}$ $\frac{9}{10}$ $\frac{10}{20}$ $\frac{1}{2}$
10. $\frac{16}{32}$ $\frac{1}{2}$ $\frac{9}{15}$ $\frac{3}{5}$ $\frac{12}{16}$ $\frac{3}{4}$ $\frac{8}{32}$ $\frac{1}{4}$ $\frac{8}{12}$ $\frac{2}{3}$ $\frac{12}{15}$ $\frac{4}{5}$ $\frac{5}{10}$ $\frac{1}{2}$ $\frac{6}{12}$ $\frac{1}{2}$ $\frac{20}{32}$ $\frac{5}{8}$

⑬ ……

11. $\frac{1}{9}+\frac{5}{9}=\frac{2}{3}$ $\frac{5}{8}+\frac{1}{8}=\frac{3}{4}$ $\frac{1}{6}+\frac{2}{6}=\frac{1}{2}$ $\frac{1}{12}+\frac{5}{12}=\frac{1}{2}$ $\frac{1}{16}+\frac{1}{16}=\frac{1}{8}$ $\frac{1}{16}+\frac{11}{16}=\frac{3}{4}$ $\frac{7}{16}+\frac{1}{16}=\frac{1}{2}$ $\frac{3}{16}+\frac{1}{16}=\frac{1}{4}$
12. $\frac{3}{8}+\frac{1}{8}=\frac{1}{2}$ $\frac{2}{6}+\frac{2}{6}=\frac{2}{3}$ $\frac{3}{8}+\frac{3}{8}=\frac{3}{4}$ $\frac{5}{16}+\frac{1}{16}=\frac{3}{8}$ $\frac{7}{16}+\frac{3}{16}=\frac{5}{8}$ $\frac{7}{12}+\frac{1}{12}=\frac{2}{3}$ $\frac{1}{12}+\frac{9}{12}=\frac{5}{6}$ $\frac{3}{12}+\frac{2}{12}=\frac{5}{12}$
13. $\frac{4}{8}+\frac{2}{8}=\frac{3}{4}$ $\frac{1}{7}+\frac{2}{7}=\frac{3}{7}$ $\frac{2}{9}+\frac{1}{9}=\frac{1}{3}$ $\frac{5}{12}+\frac{5}{12}=\frac{5}{6}$ $\frac{3}{10}+\frac{2}{10}=\frac{1}{2}$ $\frac{3}{16}+\frac{9}{16}=\frac{3}{4}$ $\frac{5}{16}+\frac{3}{16}=\frac{1}{2}$ $\frac{1}{16}+\frac{7}{16}=\frac{1}{2}$
14. $\frac{2}{8}+\frac{2}{8}=\frac{1}{2}$ $\frac{2}{9}+\frac{4}{9}=\frac{2}{3}$ $\frac{1}{8}+\frac{5}{8}=\frac{3}{4}$ $\frac{1}{16}+\frac{9}{16}=\frac{5}{8}$ $\frac{5}{12}+\frac{4}{12}=\frac{3}{4}$ $\frac{1}{16}+\frac{3}{16}=\frac{1}{4}$ $\frac{7}{16}+\frac{5}{16}=\frac{3}{4}$ $\frac{5}{10}+\frac{1}{10}=\frac{3}{5}$
15. $\frac{2}{7}+\frac{3}{7}=\frac{5}{7}$ $\frac{1}{4}+\frac{1}{4}=\frac{1}{2}$ $\frac{1}{6}+\frac{3}{6}=\frac{2}{3}$ $\frac{3}{12}+\frac{3}{12}=\frac{1}{2}$ $\frac{1}{16}+\frac{13}{16}=\frac{7}{8}$ $\frac{3}{12}+\frac{1}{12}=\frac{1}{3}$ $\frac{4}{10}+\frac{1}{10}=\frac{1}{2}$ $\frac{3}{16}+\frac{11}{16}=\frac{7}{8}$

14

1.	$\begin{array}{r} 2\frac{1}{5} \\ +1\frac{3}{5} \\ \hline 3\frac{4}{5} \end{array}$	$\begin{array}{r} 5\frac{3}{8} \\ +2\frac{1}{8} \\ \hline 7\frac{1}{2} \end{array}$	$\begin{array}{r} 3\frac{1}{3} \\ +6\frac{1}{3} \\ \hline 9\frac{2}{3} \end{array}$	$\begin{array}{r} 1\frac{3}{10} \\ +3\frac{1}{10} \\ \hline 4\frac{2}{5} \end{array}$	$\begin{array}{r} 4\frac{7}{12} \\ +5\frac{1}{12} \\ \hline 9\frac{2}{3} \end{array}$	$\begin{array}{r} 2\frac{7}{16} \\ +2\frac{7}{16} \\ \hline 4\frac{7}{8} \end{array}$	$\begin{array}{r} 3\frac{7}{10} \\ +4\frac{1}{10} \\ \hline 7\frac{4}{5} \end{array}$
2.	$\begin{array}{r} 4\frac{1}{4} \\ +1\frac{1}{4} \\ \hline 5\frac{1}{2} \end{array}$	$\begin{array}{r} 5\frac{1}{8} \\ +5\frac{1}{8} \\ \hline 10\frac{1}{4} \end{array}$	$\begin{array}{r} 3\frac{1}{8} \\ +3\frac{5}{8} \\ \hline 6\frac{3}{4} \end{array}$	$\begin{array}{r} 6\frac{5}{16} \\ +1\frac{5}{16} \\ \hline 7\frac{5}{8} \end{array}$	$\begin{array}{r} 4\frac{3}{10} \\ +2\frac{3}{10} \\ \hline 6\frac{3}{5} \end{array}$	$\begin{array}{r} 5\frac{5}{12} \\ +3\frac{5}{12} \\ \hline 8\frac{5}{6} \end{array}$	$\begin{array}{r} 5\frac{1}{16} \\ +1\frac{7}{16} \\ \hline 6\frac{1}{2} \end{array}$
3.	$\begin{array}{r} 3\frac{3}{8} \\ +5\frac{3}{8} \\ \hline 8\frac{3}{4} \end{array}$	$\begin{array}{r} 6\frac{2}{5} \\ +3\frac{2}{5} \\ \hline 9\frac{4}{5} \end{array}$	$\begin{array}{r} 6\frac{1}{6} \\ +5\frac{1}{6} \\ \hline 11\frac{1}{3} \end{array}$	$\begin{array}{r} 4\frac{5}{12} \\ +4\frac{1}{12} \\ \hline 8\frac{1}{2} \end{array}$	$\begin{array}{r} 5\frac{7}{16} \\ +6\frac{5}{16} \\ \hline 11\frac{3}{4} \end{array}$	$\begin{array}{r} 4\frac{1}{10} \\ +7\frac{1}{10} \\ \hline 11\frac{1}{5} \end{array}$	$\begin{array}{r} 2\frac{1}{12} \\ +4\frac{1}{12} \\ \hline 6\frac{1}{6} \end{array}$
4.	$\begin{array}{r} 5\frac{2}{6} \\ +4\frac{1}{6} \\ \hline 9\frac{1}{2} \end{array}$	$\begin{array}{r} 2\frac{5}{8} \\ +3\frac{1}{8} \\ \hline 5\frac{3}{4} \end{array}$	$\begin{array}{r} 4\frac{1}{5} \\ +6\frac{1}{5} \\ \hline 10\frac{2}{5} \end{array}$	$\begin{array}{r} 2\frac{5}{10} \\ +7\frac{1}{10} \\ \hline 9\frac{3}{5} \end{array}$	$\begin{array}{r} 6\frac{3}{12} \\ +2\frac{5}{12} \\ \hline 8\frac{2}{3} \end{array}$	$\begin{array}{r} 6\frac{1}{16} \\ +4\frac{9}{16} \\ \hline 10\frac{5}{8} \end{array}$	$\begin{array}{r} 4\frac{11}{16} \\ +3\frac{3}{16} \\ \hline 7\frac{7}{8} \end{array}$

15

5.	$\begin{array}{r} \frac{7}{8} \\ -\frac{5}{8} \\ \hline \frac{1}{4} \end{array}$	$\begin{array}{r} \frac{4}{5} \\ -\frac{1}{5} \\ \hline \frac{3}{5} \end{array}$	$\begin{array}{r} \frac{3}{4} \\ -\frac{1}{4} \\ \hline \frac{1}{2} \end{array}$	$\begin{array}{r} \frac{11}{12} \\ -\frac{5}{12} \\ \hline \frac{1}{2} \end{array}$	$\begin{array}{r} \frac{15}{16} \\ -\frac{1}{16} \\ \hline \frac{7}{8} \end{array}$	$\begin{array}{r} \frac{9}{10} \\ -\frac{1}{10} \\ \hline \frac{4}{5} \end{array}$	$\begin{array}{r} \frac{11}{12} \\ -\frac{7}{12} \\ \hline \frac{1}{3} \end{array}$	$\begin{array}{r} \frac{15}{16} \\ -\frac{9}{16} \\ \hline \frac{3}{8} \end{array}$
6.	$\begin{array}{r} \frac{5}{6} \\ -\frac{1}{6} \\ \hline \frac{2}{3} \end{array}$	$\begin{array}{r} \frac{7}{8} \\ -\frac{3}{8} \\ \hline \frac{1}{2} \end{array}$	$\begin{array}{r} \frac{4}{5} \\ -\frac{3}{5} \\ \hline \frac{1}{5} \end{array}$	$\begin{array}{r} \frac{15}{16} \\ -\frac{7}{16} \\ \hline \frac{1}{2} \end{array}$	$\begin{array}{r} \frac{9}{10} \\ -\frac{3}{10} \\ \hline \frac{2}{5} \end{array}$	$\begin{array}{r} \frac{5}{12} \\ -\frac{1}{12} \\ \hline \frac{1}{3} \end{array}$	$\begin{array}{r} \frac{13}{16} \\ -\frac{9}{16} \\ \hline \frac{1}{4} \end{array}$	$\begin{array}{r} \frac{7}{12} \\ -\frac{7}{12} \\ \hline 0 \end{array}$
7.	$\begin{array}{r} \frac{5}{8} \\ -\frac{3}{8} \\ \hline \frac{1}{4} \end{array}$	$\begin{array}{r} \frac{2}{3} \\ -\frac{1}{3} \\ \hline \frac{1}{3} \end{array}$	$\begin{array}{r} \frac{7}{8} \\ -\frac{1}{8} \\ \hline \frac{3}{4} \end{array}$	$\begin{array}{r} \frac{7}{10} \\ -\frac{3}{10} \\ \hline \frac{2}{5} \end{array}$	$\begin{array}{r} \frac{13}{16} \\ -\frac{5}{16} \\ \hline \frac{1}{2} \end{array}$	$\begin{array}{r} \frac{7}{12} \\ -\frac{5}{12} \\ \hline \frac{1}{6} \end{array}$	$\begin{array}{r} \frac{15}{16} \\ -\frac{3}{16} \\ \hline \frac{3}{4} \end{array}$	$\begin{array}{r} \frac{7}{12} \\ -\frac{1}{12} \\ \hline \frac{1}{2} \end{array}$
8.	$\begin{array}{r} \frac{4}{5} \\ -\frac{2}{5} \\ \hline \frac{2}{5} \end{array}$	$\begin{array}{r} \frac{5}{6} \\ -\frac{3}{6} \\ \hline \frac{1}{3} \end{array}$	$\begin{array}{r} \frac{5}{8} \\ -\frac{1}{8} \\ \hline \frac{1}{2} \end{array}$	$\begin{array}{r} \frac{15}{16} \\ -\frac{5}{16} \\ \hline \frac{5}{8} \end{array}$	$\begin{array}{r} \frac{11}{12} \\ -\frac{1}{12} \\ \hline \frac{5}{6} \end{array}$	$\begin{array}{r} \frac{15}{16} \\ -\frac{11}{16} \\ \hline \frac{1}{4} \end{array}$	$\begin{array}{r} \frac{9}{10} \\ -\frac{7}{10} \\ \hline \frac{1}{5} \end{array}$	$\begin{array}{r} \frac{13}{16} \\ -\frac{1}{16} \\ \hline \frac{3}{4} \end{array}$

16

Change to whole numbers or mixed numbers:

9. $\frac{7}{2}$ $3\frac{1}{2}$ $\frac{8}{8}$ 1 $\frac{4}{3}$ $1\frac{1}{3}$ $\frac{11}{6}$ $1\frac{5}{6}$ $\frac{16}{16}$ 1 $\frac{21}{10}$ $2\frac{1}{10}$ $\frac{49}{2}$ $4\frac{1}{12}$ $\frac{30}{15}$ 2

10. $\frac{8}{3}$ $2\frac{2}{3}$ $\frac{7}{5}$ $1\frac{2}{5}$ $\frac{4}{4}$ 1 $\frac{18}{5}$ $3\frac{3}{5}$ $\frac{25}{12}$ $2\frac{1}{12}$ $\frac{35}{16}$ $2\frac{3}{16}$ $\frac{30}{10}$ 3 $\frac{14}{4}$ $3\frac{1}{2}$

11. $\frac{5}{4}$ $1\frac{1}{4}$ $\frac{8}{2}$ 4 $\frac{9}{6}$ 1 $\frac{12}{8}$ $1\frac{1}{2}$ $\frac{20}{5}$ 4 $\frac{36}{12}$ 3 $\frac{20}{6}$ $3\frac{1}{3}$ $\frac{20}{8}$ $2\frac{1}{2}$

More Practice

⑰

1.	$\frac{1}{4}$ $+\frac{3}{4}$ 1	$\frac{4}{5}$ $+\frac{4}{5}$ $1\frac{3}{5}$	$\frac{5}{6}$ $+\frac{1}{6}$ 1	$\frac{7}{8}$ $+\frac{5}{8}$ $1\frac{1}{2}$	$\frac{13}{16}$ $+\frac{13}{16}$ $1\frac{5}{8}$	$\frac{9}{10}$ $+\frac{7}{10}$ $1\frac{3}{5}$	$\frac{7}{12}$ $+\frac{7}{12}$ $1\frac{1}{6}$	$\frac{13}{16}$ $+\frac{3}{16}$ 1
2.	$\frac{7}{8}$ $+\frac{7}{8}$ $1\frac{3}{4}$	$\frac{1}{2}$ $+\frac{1}{2}$ 1	$\frac{3}{5}$ $+\frac{2}{5}$ 1	$\frac{3}{8}$ $+\frac{5}{8}$ 1	$\frac{11}{12}$ $+\frac{11}{12}$ $1\frac{5}{6}$	$\frac{5}{16}$ $+\frac{13}{16}$ $1\frac{1}{8}$	$\frac{7}{10}$ $+\frac{7}{10}$ $1\frac{2}{5}$	$\frac{5}{12}$ $+\frac{7}{12}$ 1
3.	$\frac{1}{5}$ $+\frac{4}{5}$ 1	$\frac{4}{6}$ $+\frac{3}{6}$ $1\frac{1}{6}$	$\frac{2}{3}$ $+\frac{2}{3}$ $1\frac{1}{3}$	$\frac{3}{7}$ $+\frac{4}{7}$ 1	$\frac{11}{16}$ $+\frac{11}{16}$ $1\frac{3}{8}$	$\frac{1}{10}$ $+\frac{9}{10}$ 1	$\frac{7}{12}$ $+\frac{11}{12}$ $1\frac{1}{2}$	$\frac{15}{16}$ $+\frac{9}{16}$ $1\frac{1}{2}$
4.	$\frac{5}{8}$ $+\frac{5}{8}$ $1\frac{1}{4}$	$\frac{3}{4}$ $+\frac{3}{4}$ $1\frac{1}{2}$	$\frac{3}{8}$ $+\frac{7}{8}$ $1\frac{1}{4}$	$\frac{3}{5}$ $+\frac{3}{5}$ $1\frac{1}{5}$	$\frac{5}{12}$ $+\frac{11}{12}$ $1\frac{1}{3}$	$\frac{9}{16}$ $+\frac{7}{16}$ 1	$\frac{13}{16}$ $+\frac{7}{16}$ $1\frac{1}{4}$	$\frac{9}{10}$ $+\frac{3}{10}$ $1\frac{1}{5}$

⑱

5.	$6\frac{1}{4}$ $+4\frac{3}{4}$ 11	$8\frac{2}{3}$ $+8\frac{1}{3}$ 17	$6\frac{3}{16}$ $+2\frac{15}{16}$ $9\frac{1}{8}$	$2\frac{9}{10}$ $+4\frac{7}{10}$ $7\frac{3}{5}$	$7\frac{1}{12}$ $+1\frac{11}{12}$ 9	$3\frac{11}{16}$ $+3\frac{7}{16}$ $7\frac{1}{8}$	$2\frac{1}{10}$ $+6\frac{9}{10}$ 9
6.	$5\frac{6}{8}$ $+2\frac{6}{8}$ $8\frac{1}{2}$	$3\frac{4}{5}$ $+\frac{3}{5}$ $4\frac{2}{5}$	$9\frac{7}{12}$ $+3\frac{5}{12}$ 13	$7\frac{9}{16}$ $+2\frac{11}{16}$ $10\frac{1}{4}$	$5\frac{11}{24}$ $+6\frac{21}{24}$ $12\frac{1}{3}$	$4\frac{7}{10}$ $+6\frac{9}{10}$ $11\frac{3}{5}$	$9\frac{11}{12}$ $+6\frac{11}{12}$ $16\frac{5}{6}$
7.	$3\frac{5}{6}$ $+4\frac{5}{6}$ $8\frac{2}{3}$	$8\frac{5}{8}$ $+6\frac{7}{8}$ $15\frac{1}{2}$	$9\frac{11}{12}$ $+9\frac{1}{12}$ 19	$7\frac{9}{10}$ $+\frac{3}{10}$ $8\frac{1}{5}$	$2\frac{5}{16}$ $+3\frac{11}{16}$ 6	$8\frac{11}{20}$ $+2\frac{11}{20}$ $11\frac{1}{10}$	$3\frac{3}{10}$ $+6\frac{9}{10}$ $10\frac{1}{5}$
8.	$9\frac{5}{8}$ $+5\frac{5}{8}$ $15\frac{1}{4}$	$6\frac{2}{3}$ $+3\frac{2}{3}$ $10\frac{1}{3}$	$6\frac{9}{10}$ $+1\frac{9}{10}$ $8\frac{4}{5}$	$8\frac{11}{12}$ $+4\frac{7}{12}$ $13\frac{1}{2}$	$4\frac{7}{10}$ $+5\frac{3}{10}$ 10	$7\frac{7}{16}$ $+3\frac{9}{16}$ 11	$5\frac{7}{12}$ $+5\frac{7}{12}$ $11\frac{1}{6}$
9.	$5\frac{6}{7}$ $+4\frac{4}{7}$ $10\frac{3}{7}$	$2\frac{5}{6}$ $+5\frac{1}{6}$ 8	$5\frac{5}{12}$ $+1\frac{11}{12}$ $7\frac{1}{3}$	$2\frac{15}{16}$ $+2\frac{11}{16}$ $5\frac{5}{8}$	$9\frac{7}{10}$ $+8\frac{7}{10}$ $18\frac{2}{5}$	$8\frac{5}{12}$ $+\frac{7}{12}$ 9	$9\frac{3}{16}$ $+2\frac{13}{16}$ 12
10.	$4\frac{1}{2}$ $+4\frac{1}{2}$ 9	$9\frac{5}{9}$ $+7\frac{8}{9}$ $17\frac{4}{9}$	$6\frac{17}{32}$ $+\frac{15}{32}$ 7	$8\frac{3}{12}$ $+7\frac{11}{12}$ $16\frac{1}{6}$	$3\frac{11}{16}$ $+5\frac{15}{16}$ $9\frac{5}{8}$	$9\frac{3}{10}$ $+1\frac{7}{10}$ 11	$8\frac{11}{12}$ $+5\frac{5}{12}$ $14\frac{1}{3}$
11.	$8\frac{3}{4}$ $+3\frac{3}{4}$ $12\frac{1}{2}$	$5\frac{3}{8}$ $+\frac{7}{8}$ $6\frac{1}{4}$	$9\frac{7}{12}$ $+4\frac{11}{12}$ $14\frac{1}{2}$	$6\frac{11}{16}$ $+5\frac{5}{16}$ 12	$2\frac{7}{24}$ $+7\frac{17}{24}$ 10	$1\frac{15}{16}$ $+1\frac{7}{16}$ $3\frac{3}{8}$	$5\frac{9}{10}$ $+3\frac{1}{10}$ 9

⑲

1. 54625	46535	47689	65172	41094
38369	28786	36567	8079	29512
32903	63245	8973	86587	54671
43142	59564	71246	5977	39049
14786	20534	56128	34185	42447
183,825	218,664	220,603	200,000	206,773
2. 23958	35605	95739	53309	45662
64246	8390	28872	44929	21478
45671	6375	83518	76865	37195
14132	76500	64874	30207	18211
20849	45348	74163	66722	20362
168,856	172,218	347,166	272,032	142,908
3. 39377	18879	23485	59050	23983
32845	23342	85060	45506	17106
53563	47298	10141	70920	54687
20824	19161	71099	65179	20630
21474	43746	22526	27071	73562
168,083	152,426	212,311	267,726	189,968

⑳

4. 1494 ÷ 19 78R12 2120 ÷ 36 58R32 2948 ÷ 39 75R23 1279 ÷ 28 45R19

5. 6500 ÷ 66 98R32 5651 ÷ 88 64R19 3033 ÷ 47 64R25 2969 ÷ 86 34R45

6. 4635 ÷ 49 94R29 2263 ÷ 38 59R21 4467 ÷ 56 79R43 4831 ÷ 58 83R17

7. 2010 ÷ 37 54R12 1667 ÷ 29 57R14 1591 ÷ 27 58R25 2147 ÷ 46 46R31

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8. 13,794 ÷ 22 627 13,135 ÷ 56 234R31 12,798 ÷ 54 237

9. 12,630 ÷ 27 467R21 36,101 ÷ 69 523R14 13,630 ÷ 39 349R19

10. 10,810 ÷ 19 568R18 24,822 ÷ 57 435R27 62,488 ÷ 73 856

11. 43,633 ÷ 58 752R17 12,920 ÷ 36 358R32 27,391 ÷ 43 637

12. 49,201 ÷ 67 734R23 27,003 ÷ 28 964R11 42,900 ÷ 48 893R36

13. 27,300 ÷ 59 462R42 13,163 ÷ 38 346R15 17,513 ÷ 66 265R23

14. 16,811 ÷ 46 365R21 23,892 ÷ 44 543 26,100 ÷ 49 532R32

More Practice

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1. 29)261 9   78)546 7   66)530 8R2   26)130 5   39)273 7
2. 47)282 6   36)331 9R7   27)146 5R11   58)464 8   28)168 6
3. 38)270 7R4   49)294 6   67)603 9   37)303 8R7   86)774 9

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4. 1152 ÷ 36 32   2668 ÷ 29 92   19,603 ÷ 46 426R7
5. 4104 ÷ 57 72   2356 ÷ 38 62   14,364 ÷ 27 532
6. 5576 ÷ 68 82   4592 ÷ 56 82   15,300 ÷ 36 425
7. 2736 ÷ 36 76   1431 ÷ 27 53   31,154 ÷ 37 842
8. 1690 ÷ 26 65   2961 ÷ 47 63   54,186 ÷ 66 821
9. 6231 ÷ 67 93   3317 ÷ 36 92R5   29,904 ÷ 48 623
10. 1924 ÷ 37 52   3818 ÷ 46 83   79,206 ÷ 86 921

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11. 8891 ÷ 24 370R11   33,750 ÷ 75 450   24,180 ÷ 62 390
12. 8765 ÷ 73 120R5   18,690 ÷ 21 890   25,785 ÷ 46 560R25
13. 8735 ÷ 58 150R35   10,810 ÷ 47 230   12,240 ÷ 51 240
14. 9467 ÷ 22 430R7   18,143 ÷ 49 370R13   47,740 ÷ 77 620
15. 7650 ÷ 45 170   14,587 ÷ 28 520R27   11,470 ÷ 37 310
16. 7250 ÷ 29 250   26,240 ÷ 64 410   54,755 ÷ 76 720R35
17. 7932 ÷ 33 240R12   27,395 ÷ 48 570R35   28,220 ÷ 34 830

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18. 24,688 ÷ 35 705R13   14,217 ÷ 69 206R3   19,296 ÷ 24 804
19. 31,186 ÷ 62 503   17,556 ÷ 57 308   45,225 ÷ 75 603
20. 27,922 ÷ 46 607   57,186 ÷ 81 706   29,301 ÷ 58 505R11
21. 15,141 ÷ 49 309   25,312 ÷ 28 904   27,404 ÷ 34 806
22. 21,552 ÷ 53 406R34   28,504 ÷ 56 509   24,516 ÷ 27 908

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1.	$\begin{array}{r}47\\17\overline{)799}\end{array}$	$\begin{array}{r}84\text{R}7\\13\overline{)1099}\end{array}$	$\begin{array}{r}78\\16\overline{)1248}\end{array}$	$\begin{array}{r}98\\15\overline{)1470}\end{array}$	$\begin{array}{r}847\\18\overline{)15246}\end{array}$
2.	$\begin{array}{r}34\text{R}9\\15\overline{)519}\end{array}$	$\begin{array}{r}85\text{R}9\\14\overline{)1199}\end{array}$	$\begin{array}{r}273\\18\overline{)4914}\end{array}$	$\begin{array}{r}79\text{R}11\\13\overline{)1038}\end{array}$	$\begin{array}{r}861\\17\overline{)14637}\end{array}$
3.	$\begin{array}{r}46\\14\overline{)644}\end{array}$	$\begin{array}{r}96\\15\overline{)1440}\end{array}$	$\begin{array}{r}94\\16\overline{)1504}\end{array}$	$\begin{array}{r}169\\18\overline{)3042}\end{array}$	$\begin{array}{r}967\\13\overline{)12571}\end{array}$
4.	$\begin{array}{r}44\\18\overline{)792}\end{array}$	$\begin{array}{r}67\text{R}5\\16\overline{)1077}\end{array}$	$\begin{array}{r}325\\18\overline{)5850}\end{array}$	$\begin{array}{r}93\\14\overline{)1302}\end{array}$	$\begin{array}{r}932\\17\overline{)15844}\end{array}$
5.	$\begin{array}{r}35\text{R}11\\13\overline{)466}\end{array}$	$\begin{array}{r}75\\15\overline{)1125}\end{array}$	$\begin{array}{r}73\\16\overline{)1168}\end{array}$	$\begin{array}{r}59\\17\overline{)1003}\end{array}$	$\begin{array}{r}742\\14\overline{)10388}\end{array}$

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6.	$\begin{array}{r}9\text{R}27\\35\overline{)342}\end{array}$	$\begin{array}{r}8\text{R}18\\24\overline{)210}\end{array}$	$\begin{array}{r}99\text{R}28\\33\overline{)3295}\end{array}$	$\begin{array}{r}891\\24\overline{)21384}\end{array}$	$\begin{array}{r}887\text{R}16\\23\overline{)20417}\end{array}$
7.	$\begin{array}{r}9\text{R}18\\22\overline{)216}\end{array}$	$\begin{array}{r}9\text{R}20\\43\overline{)407}\end{array}$	$\begin{array}{r}91\\25\overline{)2275}\end{array}$	$\begin{array}{r}989\text{R}19\\34\overline{)33645}\end{array}$	$\begin{array}{r}998\text{R}22\\53\overline{)52916}\end{array}$
8.	$\begin{array}{r}8\text{R}31\\34\overline{)303}\end{array}$	$\begin{array}{r}8\text{R}17\\23\overline{)201}\end{array}$	$\begin{array}{r}89\\24\overline{)2136}\end{array}$	$\begin{array}{r}999\\22\overline{)21978}\end{array}$	$\begin{array}{r}883\\25\overline{)22075}\end{array}$
9.	$\begin{array}{r}9\text{R}16\\21\overline{)205}\end{array}$	$\begin{array}{r}9\text{R}42\\52\overline{)510}\end{array}$	$\begin{array}{r}96\\35\overline{)3360}\end{array}$	$\begin{array}{r}989\\42\overline{)41538}\end{array}$	$\begin{array}{r}989\text{R}41\\45\overline{)44546}\end{array}$
10.	$\begin{array}{r}9\text{R}32\\44\overline{)428}\end{array}$	$\begin{array}{r}9\text{R}21\\31\overline{)300}\end{array}$	$\begin{array}{r}87\text{R}20\\25\overline{)2195}\end{array}$	$\begin{array}{r}989\\35\overline{)34615}\end{array}$	$\begin{array}{r}988\\24\overline{)23712}\end{array}$
11.	$\begin{array}{r}8\\25\overline{)200}\end{array}$	$\begin{array}{r}9\text{R}22\\33\overline{)319}\end{array}$	$\begin{array}{r}99\text{R}40\\43\overline{)4297}\end{array}$	$\begin{array}{r}989\\25\overline{)24725}\end{array}$	$\begin{array}{r}899\\21\overline{)18879}\end{array}$
12.	$\begin{array}{r}8\text{R}42\\45\overline{)402}\end{array}$	$\begin{array}{r}8\text{R}15\\25\overline{)215}\end{array}$	$\begin{array}{r}89\\35\overline{)3115}\end{array}$	$\begin{array}{r}890\text{R}14\\23\overline{)20484}\end{array}$	$\begin{array}{r}892\text{R}26\\35\overline{)31246}\end{array}$

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13.	$\begin{array}{r}\frac{1}{3}\\+\frac{1}{6}\\\hline\frac{1}{2}\end{array}$	$\begin{array}{r}\frac{3}{4}\\+\frac{1}{8}\\\hline\frac{7}{8}\end{array}$	$\begin{array}{r}\frac{1}{4}\\+\frac{5}{8}\\\hline\frac{7}{8}\end{array}$	$\begin{array}{r}\frac{1}{2}\\+\frac{5}{16}\\\hline\frac{13}{16}\end{array}$	$\begin{array}{r}\frac{1}{3}\\+\frac{7}{12}\\\hline\frac{11}{12}\end{array}$	$\begin{array}{r}\frac{3}{8}\\+\frac{9}{16}\\\hline\frac{15}{16}\end{array}$	$\begin{array}{r}\frac{1}{2}\\+\frac{1}{10}\\\hline\frac{3}{5}\end{array}$	$\begin{array}{r}\frac{5}{6}\\+\frac{1}{12}\\\hline\frac{11}{12}\end{array}$
14.	$\begin{array}{r}\frac{3}{8}\\+\frac{1}{4}\\\hline\frac{5}{8}\end{array}$	$\begin{array}{r}\frac{2}{3}\\+\frac{1}{6}\\\hline\frac{5}{6}\end{array}$	$\begin{array}{r}\frac{1}{4}\\+\frac{1}{2}\\\hline\frac{3}{4}\end{array}$	$\begin{array}{r}\frac{3}{5}\\+\frac{1}{10}\\\hline\frac{7}{10}\end{array}$	$\begin{array}{r}\frac{3}{16}\\+\frac{1}{4}\\\hline\frac{7}{16}\end{array}$	$\begin{array}{r}\frac{5}{12}\\+\frac{1}{6}\\\hline\frac{7}{12}\end{array}$	$\begin{array}{r}\frac{9}{16}\\+\frac{1}{4}\\\hline\frac{13}{16}\end{array}$	$\begin{array}{r}\frac{3}{4}\\+\frac{1}{16}\\\hline\frac{13}{16}\end{array}$
15.	$\begin{array}{r}\frac{1}{6}\\+\frac{1}{2}\\\hline\frac{2}{3}\end{array}$	$\begin{array}{r}\frac{1}{2}\\+\frac{3}{8}\\\hline\frac{7}{8}\end{array}$	$\begin{array}{r}\frac{1}{8}\\+\frac{1}{4}\\\hline\frac{3}{8}\end{array}$	$\begin{array}{r}\frac{1}{2}\\+\frac{5}{12}\\\hline\frac{11}{12}\end{array}$	$\begin{array}{r}\frac{3}{10}\\+\frac{2}{5}\\\hline\frac{7}{10}\end{array}$	$\begin{array}{r}\frac{7}{12}\\+\frac{1}{4}\\\hline\frac{5}{6}\end{array}$	$\begin{array}{r}\frac{1}{5}\\+\frac{1}{10}\\\hline\frac{3}{10}\end{array}$	$\begin{array}{r}\frac{7}{16}\\+\frac{1}{8}\\\hline\frac{9}{16}\end{array}$

More Practice

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1. $\begin{array}{r}\frac{1}{2}\\+\frac{5}{6}\\\hline 1\frac{1}{3}\end{array}$ $\begin{array}{r}\frac{1}{4}\\+\frac{7}{8}\\\hline 1\frac{1}{8}\end{array}$ $\begin{array}{r}\frac{7}{8}\\+\frac{1}{2}\\\hline 1\frac{3}{8}\end{array}$ $\begin{array}{r}\frac{7}{12}\\+\frac{2}{3}\\\hline 1\frac{1}{4}\end{array}$ $\begin{array}{r}\frac{5}{8}\\+\frac{13}{16}\\\hline 1\frac{7}{16}\end{array}$ $\begin{array}{r}\frac{1}{2}\\+\frac{9}{10}\\\hline 1\frac{2}{5}\end{array}$ $\begin{array}{r}\frac{3}{8}\\+\frac{15}{16}\\\hline 1\frac{5}{16}\end{array}$ $\begin{array}{r}\frac{4}{5}\\+\frac{3}{10}\\\hline 1\frac{1}{10}\end{array}$

2. $\begin{array}{r}\frac{3}{4}\\+\frac{1}{2}\\\hline 1\frac{1}{4}\end{array}$ $\begin{array}{r}\frac{3}{8}\\+\frac{3}{4}\\\hline 1\frac{1}{8}\end{array}$ $\begin{array}{r}\frac{1}{3}\\+\frac{5}{6}\\\hline 1\frac{1}{6}\end{array}$ $\begin{array}{r}\frac{7}{16}\\+\frac{3}{4}\\\hline 1\frac{3}{16}\end{array}$ $\begin{array}{r}\frac{1}{4}\\+\frac{15}{16}\\\hline 1\frac{3}{16}\end{array}$ $\begin{array}{r}\frac{3}{4}\\+\frac{5}{12}\\\hline 1\frac{1}{6}\end{array}$ $\begin{array}{r}\frac{3}{5}\\+\frac{9}{10}\\\hline 1\frac{1}{2}\end{array}$ $\begin{array}{r}\frac{5}{8}\\+\frac{11}{16}\\\hline 1\frac{5}{16}\end{array}$

3. $\begin{array}{r}\frac{2}{3}\\+\frac{5}{6}\\\hline 1\frac{1}{2}\end{array}$ $\begin{array}{r}\frac{1}{2}\\+\frac{5}{8}\\\hline 1\frac{1}{8}\end{array}$ $\begin{array}{r}\frac{5}{6}\\+\frac{1}{2}\\\hline 1\frac{1}{3}\end{array}$ $\begin{array}{r}\frac{1}{2}\\+\frac{7}{10}\\\hline 1\frac{1}{5}\end{array}$ $\begin{array}{r}\frac{11}{12}\\+\frac{3}{4}\\\hline 1\frac{2}{3}\end{array}$ $\begin{array}{r}\frac{1}{2}\\+\frac{13}{16}\\\hline 1\frac{5}{16}\end{array}$ $\begin{array}{r}\frac{1}{3}\\+\frac{11}{12}\\\hline 1\frac{1}{4}\end{array}$ $\begin{array}{r}\frac{9}{10}\\+\frac{2}{5}\\\hline 1\frac{3}{10}\end{array}$

4. $\begin{array}{r}\frac{5}{6}\\+\frac{1}{3}\\\hline 1\frac{1}{6}\end{array}$ $\begin{array}{r}\frac{1}{2}\\+\frac{3}{4}\\\hline 1\frac{1}{4}\end{array}$ $\begin{array}{r}\frac{3}{4}\\+\frac{7}{8}\\\hline 1\frac{5}{8}\end{array}$ $\begin{array}{r}\frac{2}{5}\\+\frac{7}{10}\\\hline 1\frac{1}{10}\end{array}$ $\begin{array}{r}\frac{5}{6}\\+\frac{5}{12}\\\hline 1\frac{1}{4}\end{array}$ $\begin{array}{r}\frac{2}{3}\\+\frac{7}{12}\\\hline 1\frac{1}{4}\end{array}$ $\begin{array}{r}\frac{9}{16}\\+\frac{1}{2}\\\hline 1\frac{1}{16}\end{array}$ $\begin{array}{r}\frac{3}{4}\\+\frac{11}{16}\\\hline 1\frac{7}{16}\end{array}$

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5. $\begin{array}{r}4\frac{3}{4}\\+2\frac{1}{2}\\\hline 7\frac{1}{4}\end{array}$ $\begin{array}{r}3\frac{5}{6}\\+9\frac{2}{3}\\\hline 13\frac{1}{2}\end{array}$ $\begin{array}{r}1\frac{5}{6}\\+9\frac{5}{12}\\\hline 11\frac{1}{4}\end{array}$ $\begin{array}{r}5\frac{1}{2}\\+2\frac{7}{10}\\\hline 8\frac{1}{5}\end{array}$ $\begin{array}{r}6\frac{1}{4}\\+4\frac{15}{16}\\\hline 11\frac{3}{16}\end{array}$ $\begin{array}{r}2\frac{11}{12}\\+7\frac{2}{3}\\\hline 10\frac{7}{12}\end{array}$ $\begin{array}{r}1\frac{3}{5}\\+6\frac{9}{10}\\\hline 8\frac{1}{2}\end{array}$

6. $\begin{array}{r}7\frac{3}{4}\\+1\frac{3}{8}\\\hline 9\frac{1}{8}\end{array}$ $\begin{array}{r}6\frac{1}{3}\\+3\frac{5}{6}\\\hline 10\frac{1}{6}\end{array}$ $\begin{array}{r}2\frac{1}{10}\\+9\frac{1}{2}\\\hline 11\frac{3}{5}\end{array}$ $\begin{array}{r}4\frac{5}{8}\\+8\frac{15}{16}\\\hline 13\frac{9}{16}\end{array}$ $\begin{array}{r}9\frac{1}{5}\\+3\frac{9}{10}\\\hline 13\frac{1}{10}\end{array}$ $\begin{array}{r}8\frac{9}{16}\\+4\frac{1}{4}\\\hline 12\frac{13}{16}\end{array}$ $\begin{array}{r}1\frac{1}{3}\\+7\frac{11}{12}\\\hline 9\frac{1}{4}\end{array}$

7. $\begin{array}{r}4\frac{5}{6}\\+7\frac{1}{2}\\\hline 12\frac{1}{3}\end{array}$ $\begin{array}{r}1\frac{1}{2}\\+4\frac{1}{6}\\\hline 5\frac{2}{3}\end{array}$ $\begin{array}{r}3\frac{2}{3}\\+7\frac{7}{12}\\\hline 11\frac{1}{4}\end{array}$ $\begin{array}{r}3\frac{7}{10}\\+4\frac{3}{5}\\\hline 8\frac{3}{10}\end{array}$ $\begin{array}{r}5\frac{1}{2}\\+6\frac{7}{12}\\\hline 12\frac{1}{12}\end{array}$ $\begin{array}{r}2\frac{3}{4}\\+8\frac{11}{16}\\\hline 11\frac{7}{16}\end{array}$ $\begin{array}{r}7\frac{5}{6}\\+4\frac{7}{12}\\\hline 12\frac{5}{12}\end{array}$

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8. $\begin{array}{r}\frac{3}{8}\\-\frac{1}{4}\\\hline \frac{1}{8}\end{array}$ $\begin{array}{r}\frac{5}{6}\\-\frac{2}{3}\\\hline \frac{1}{6}\end{array}$ $\begin{array}{r}\frac{1}{4}\\-\frac{3}{16}\\\hline \frac{1}{16}\end{array}$ $\begin{array}{r}\frac{3}{4}\\-\frac{5}{12}\\\hline \frac{1}{3}\end{array}$ $\begin{array}{r}\frac{15}{16}\\-\frac{1}{2}\\\hline \frac{7}{16}\end{array}$ $\begin{array}{r}\frac{7}{10}\\-\frac{2}{5}\\\hline \frac{3}{10}\end{array}$ $\begin{array}{r}\frac{11}{12}\\-\frac{2}{3}\\\hline \frac{1}{4}\end{array}$ $\begin{array}{r}\frac{4}{5}\\-\frac{7}{10}\\\hline \frac{1}{10}\end{array}$ $\begin{array}{r}\frac{7}{16}\\-\frac{1}{8}\\\hline \frac{5}{16}\end{array}$

9. $\begin{array}{r}\frac{1}{2}\\-\frac{3}{8}\\\hline \frac{1}{8}\end{array}$ $\begin{array}{r}\frac{5}{8}\\-\frac{1}{2}\\\hline \frac{1}{8}\end{array}$ $\begin{array}{r}\frac{7}{8}\\-\frac{3}{16}\\\hline \frac{11}{16}\end{array}$ $\begin{array}{r}\frac{4}{5}\\-\frac{3}{10}\\\hline \frac{1}{2}\end{array}$ $\begin{array}{r}\frac{5}{12}\\-\frac{1}{6}\\\hline \frac{1}{4}\end{array}$ $\begin{array}{r}\frac{1}{2}\\-\frac{1}{16}\\\hline \frac{7}{16}\end{array}$ $\begin{array}{r}\frac{3}{4}\\-\frac{9}{16}\\\hline \frac{3}{16}\end{array}$ $\begin{array}{r}\frac{11}{12}\\-\frac{1}{6}\\\hline \frac{3}{4}\end{array}$ $\begin{array}{r}\frac{7}{10}\\-\frac{1}{2}\\\hline \frac{1}{5}\end{array}$

10. $\begin{array}{r}\frac{7}{8}\\-\frac{1}{2}\\\hline \frac{3}{8}\end{array}$ $\begin{array}{r}\frac{5}{6}\\-\frac{1}{2}\\\hline \frac{1}{3}\end{array}$ $\begin{array}{r}\frac{11}{12}\\-\frac{5}{6}\\\hline \frac{1}{12}\end{array}$ $\begin{array}{r}\frac{13}{16}\\-\frac{1}{4}\\\hline \frac{9}{16}\end{array}$ $\begin{array}{r}\frac{9}{10}\\-\frac{1}{5}\\\hline \frac{7}{10}\end{array}$ $\begin{array}{r}\frac{5}{6}\\-\frac{1}{12}\\\hline \frac{3}{4}\end{array}$ $\begin{array}{r}\frac{7}{10}\\-\frac{1}{5}\\\hline \frac{1}{2}\end{array}$ $\begin{array}{r}\frac{7}{8}\\-\frac{11}{16}\\\hline \frac{3}{16}\end{array}$ $\begin{array}{r}\frac{3}{4}\\-\frac{1}{12}\\\hline \frac{2}{3}\end{array}$

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1.	$\frac{1}{2}$ $+\frac{1}{5}$ $\frac{7}{10}$	$\frac{2}{3}$ $+\frac{1}{2}$ $1\frac{1}{6}$	$4\frac{1}{2}$ $+1\frac{4}{5}$ $6\frac{3}{10}$	$3\frac{1}{2}$ $+3\frac{1}{3}$ $6\frac{5}{6}$	$2\frac{2}{3}$ $+6\frac{1}{4}$ $8\frac{11}{12}$	$1\frac{3}{5}$ $+2\frac{1}{3}$ $3\frac{14}{15}$	$5\frac{1}{4}$ $+5\frac{1}{3}$ $10\frac{7}{12}$
2.	$\frac{2}{3}$ $+\frac{3}{4}$ $1\frac{5}{12}$	$\frac{1}{2}$ $+\frac{2}{5}$ $\frac{9}{10}$	$6\frac{2}{3}$ $+3\frac{1}{5}$ $9\frac{13}{15}$	$4\frac{1}{2}$ $+2\frac{2}{3}$ $7\frac{1}{6}$	$1\frac{2}{5}$ $+6\frac{1}{4}$ $7\frac{13}{20}$	$2\frac{2}{5}$ $+2\frac{1}{2}$ $4\frac{9}{10}$	$4\frac{1}{4}$ $+5\frac{1}{5}$ $9\frac{9}{20}$
3.	$\frac{1}{2}$ $-\frac{1}{3}$ $\frac{1}{6}$	$\frac{3}{4}$ $-\frac{1}{5}$ $\frac{11}{20}$	$9\frac{2}{3}$ $-2\frac{1}{4}$ $7\frac{5}{12}$	$7\frac{1}{3}$ $-3\frac{1}{5}$ $4\frac{2}{15}$	$4\frac{3}{5}$ $-3\frac{1}{4}$ $1\frac{7}{20}$	$5\frac{1}{4}$ $-2\frac{1}{5}$ $3\frac{1}{20}$	$8\frac{2}{3}$ $-4\frac{1}{2}$ $4\frac{1}{6}$
4.	$\frac{4}{5}$ $-\frac{1}{4}$ $\frac{11}{20}$	$\frac{1}{3}$ $-\frac{1}{4}$ $\frac{1}{12}$	$5\frac{1}{2}$ $-1\frac{1}{5}$ $4\frac{3}{10}$	$8\frac{3}{4}$ $-2\frac{2}{3}$ $6\frac{1}{12}$	$6\frac{4}{5}$ $-4\frac{3}{4}$ $2\frac{1}{20}$	$9\frac{3}{4}$ $-6\frac{1}{3}$ $3\frac{5}{12}$	$7\frac{1}{2}$ $-2\frac{2}{5}$ $5\frac{1}{10}$

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5.	1 $-\frac{1}{5}$ $\frac{4}{5}$	1 $-\frac{1}{2}$ $\frac{1}{2}$	1 $-\frac{4}{5}$ $\frac{1}{5}$	1 $-\frac{2}{3}$ $\frac{1}{3}$	1 $-\frac{3}{10}$ $\frac{7}{10}$	1 $-\frac{5}{12}$ $\frac{7}{12}$	1 $-\frac{5}{16}$ $\frac{11}{16}$	1 $-\frac{11}{12}$ $\frac{1}{12}$
6.	1 $-\frac{5}{8}$ $\frac{3}{8}$	1 $-\frac{3}{4}$ $\frac{1}{4}$	1 $-\frac{1}{8}$ $\frac{7}{8}$	1 $-\frac{2}{5}$ $\frac{3}{5}$	1 $-\frac{9}{16}$ $\frac{7}{16}$	1 $-\frac{7}{10}$ $\frac{3}{10}$	1 $-\frac{1}{12}$ $\frac{11}{12}$	1 $-\frac{11}{16}$ $\frac{5}{16}$

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7.	6 $-\frac{1}{2}$ $5\frac{1}{2}$	2 $-\frac{3}{4}$ $1\frac{1}{4}$	6 $-2\frac{1}{3}$ $3\frac{2}{3}$	3 $-1\frac{9}{10}$ $1\frac{1}{10}$	9 $-3\frac{5}{16}$ $5\frac{11}{16}$	4 $-3\frac{7}{12}$ $\frac{5}{12}$	5 $-3\frac{1}{16}$ $1\frac{15}{16}$
8.	4 $-\frac{2}{5}$ $3\frac{3}{5}$	8 $-\frac{7}{8}$ $7\frac{1}{8}$	7 $-3\frac{1}{4}$ $3\frac{3}{4}$	5 $-4\frac{11}{16}$ $\frac{5}{16}$	7 $-4\frac{11}{12}$ $2\frac{1}{12}$	2 $-\frac{13}{16}$ $1\frac{3}{16}$	6 $-4\frac{3}{10}$ $1\frac{7}{10}$
9.	6 $-\frac{2}{3}$ $5\frac{1}{3}$	3 $-\frac{5}{6}$ $2\frac{1}{6}$	9 $-4\frac{3}{5}$ $4\frac{2}{5}$	2 $-1\frac{5}{12}$ $\frac{7}{12}$	5 $-1\frac{3}{16}$ $3\frac{13}{16}$	3 $-2\frac{7}{10}$ $\frac{3}{10}$	8 $-5\frac{7}{16}$ $2\frac{9}{16}$
10.	9 $-\frac{1}{6}$ $8\frac{5}{6}$	7 $-\frac{4}{5}$ $6\frac{1}{5}$	4 $-1\frac{5}{8}$ $2\frac{3}{8}$	6 $-5\frac{1}{10}$ $\frac{9}{10}$	8 $-2\frac{15}{16}$ $5\frac{1}{16}$	5 $-2\frac{9}{16}$ $2\frac{7}{16}$	9 $-2\frac{1}{12}$ $6\frac{11}{12}$

More Practice

35

1.	$7\frac{1}{4}$ $-\frac{3}{4}$ $6\frac{1}{2}$	$4\frac{2}{5}$ $-\frac{4}{5}$ $3\frac{3}{5}$	$5\frac{3}{16}$ $-2\frac{13}{16}$ $2\frac{3}{8}$	$9\frac{1}{12}$ $-8\frac{11}{12}$ $\frac{1}{6}$	$6\frac{1}{10}$ $-3\frac{3}{10}$ $2\frac{4}{5}$	$8\frac{7}{16}$ $-6\frac{15}{16}$ $1\frac{1}{2}$	$7\frac{7}{12}$ $-4\frac{11}{12}$ $2\frac{2}{3}$
2.	$2\frac{1}{5}$ $-\frac{3}{5}$ $1\frac{3}{5}$	$6\frac{5}{8}$ $-\frac{7}{8}$ $5\frac{3}{4}$	$7\frac{3}{10}$ $-6\frac{7}{10}$ $\frac{3}{5}$	$3\frac{1}{16}$ $-2\frac{13}{16}$ $\frac{1}{4}$	$9\frac{5}{12}$ $-5\frac{11}{12}$ $3\frac{1}{2}$	$2\frac{3}{10}$ $-1\frac{9}{10}$ $\frac{2}{5}$	$8\frac{5}{16}$ $-2\frac{15}{16}$ $5\frac{3}{8}$
3.	$4\frac{3}{8}$ $-\frac{7}{8}$ $3\frac{1}{2}$	$3\frac{1}{8}$ $-\frac{3}{8}$ $2\frac{3}{4}$	$8\frac{5}{12}$ $-3\frac{7}{12}$ $4\frac{5}{6}$	$4\frac{7}{10}$ $-3\frac{9}{10}$ $\frac{4}{5}$	$7\frac{9}{16}$ $-2\frac{13}{16}$ $4\frac{3}{4}$	$6\frac{1}{10}$ $-\frac{9}{10}$ $5\frac{1}{5}$	$9\frac{11}{16}$ $-7\frac{13}{16}$ $1\frac{7}{8}$

36

4.	$3\frac{1}{16}$ $-\frac{3}{16}$ $2\frac{7}{8}$	$4\frac{1}{12}$ $-\frac{7}{12}$ $3\frac{1}{2}$	$4\frac{3}{16}$ $-2\frac{7}{16}$ $1\frac{3}{4}$	$8\frac{5}{12}$ $-1\frac{7}{12}$ $6\frac{5}{6}$	$3\frac{5}{16}$ $-2\frac{13}{16}$ $\frac{1}{2}$	$5\frac{3}{10}$ $-1\frac{7}{10}$ $3\frac{3}{5}$	$9\frac{7}{16}$ $-4\frac{9}{16}$ $4\frac{7}{8}$
5.	$8\frac{7}{10}$ $-\frac{9}{10}$ $7\frac{4}{5}$	$7\frac{9}{16}$ $-\frac{15}{16}$ $6\frac{5}{8}$	$9\frac{7}{16}$ $-6\frac{11}{16}$ $2\frac{3}{4}$	$2\frac{1}{12}$ $-1\frac{5}{12}$ $\frac{2}{3}$	$8\frac{3}{16}$ $-5\frac{11}{16}$ $2\frac{1}{2}$	$7\frac{5}{12}$ $-6\frac{11}{12}$ $\frac{1}{2}$	$5\frac{9}{16}$ $-3\frac{11}{16}$ $1\frac{7}{8}$

37

6.	$\frac{1}{4}$ $\frac{3}{4}$ $+\frac{1}{4}$ $1\frac{1}{4}$	$\frac{5}{6}$ $\frac{5}{6}$ $+\frac{5}{6}$ $2\frac{1}{2}$	$1\frac{3}{8}$ $4\frac{7}{8}$ $+2\frac{7}{8}$ $9\frac{1}{8}$	$5\frac{3}{10}$ $1\frac{3}{10}$ $+3\frac{7}{10}$ $10\frac{3}{10}$	$4\frac{7}{16}$ $2\frac{1}{16}$ $+6\frac{9}{16}$ $13\frac{1}{16}$	$3\frac{5}{12}$ $3\frac{1}{12}$ $+4\frac{11}{12}$ $11\frac{5}{12}$	$7\frac{9}{16}$ $\frac{9}{16}$ $+1\frac{1}{16}$ $9\frac{3}{16}$
7.	$\frac{3}{4}$ $\frac{3}{4}$ $+\frac{7}{8}$ $2\frac{3}{8}$	$\frac{1}{8}$ $\frac{1}{2}$ $+\frac{3}{8}$ 1	$3\frac{5}{6}$ $2\frac{2}{3}$ $+4\frac{5}{6}$ $11\frac{1}{3}$	$6\frac{11}{16}$ $7\frac{7}{8}$ $+1\frac{3}{16}$ $15\frac{3}{4}$	$3\frac{7}{10}$ $8\frac{4}{5}$ $+3\frac{1}{10}$ $15\frac{3}{5}$	$1\frac{5}{6}$ $5\frac{11}{12}$ $+2\frac{7}{12}$ $10\frac{1}{3}$	$4\frac{1}{2}$ $1\frac{7}{16}$ $+4\frac{13}{16}$ $10\frac{3}{4}$
8.	$\frac{1}{2}$ $\frac{1}{4}$ $+\frac{1}{8}$ $\frac{7}{8}$	$\frac{5}{6}$ $\frac{2}{3}$ $+\frac{1}{2}$ 2	$6\frac{3}{8}$ $2\frac{3}{4}$ $+8\frac{1}{2}$ $17\frac{5}{8}$	$8\frac{1}{2}$ $1\frac{3}{5}$ $+4\frac{7}{10}$ $14\frac{4}{5}$	$5\frac{5}{12}$ $2\frac{1}{6}$ $+2\frac{2}{3}$ $10\frac{1}{4}$	$1\frac{3}{4}$ $2\frac{7}{16}$ $+3\frac{3}{8}$ $7\frac{9}{16}$	$2\frac{9}{10}$ $2\frac{1}{2}$ $+2\frac{4}{5}$ $8\frac{1}{5}$

9. $\frac{3}{4} + \frac{3}{4} + \frac{3}{4}$ $2\frac{1}{4}$ $\qquad 2\frac{2}{3} + 4\frac{2}{3} + 1\frac{2}{3}$ 9 $\qquad 7\frac{1}{4} + 2\frac{5}{12} + \frac{1}{3}$ 10

㊳

1. $285 \div 60$ $4\frac{3}{4}$ $1784 \div 28$ $63\frac{5}{7}$ $2320 \div 24$ $96\frac{2}{3}$ $1752 \div 54$ $32\frac{4}{9}$
2. $985 \div 25$ $39\frac{2}{5}$ $1540 \div 16$ $96\frac{1}{4}$ $2160 \div 56$ $38\frac{4}{7}$ $2765 \div 49$ $56\frac{3}{7}$
3. $724 \div 34$ $21\frac{5}{17}$ $3978 \div 54$ $73\frac{2}{3}$ $1347 \div 18$ $74\frac{5}{6}$ $4112 \div 48$ $85\frac{2}{3}$
4. $190 \div 12$ $15\frac{5}{6}$ $3495 \div 40$ $87\frac{3}{8}$ $3795 \div 77$ $49\frac{2}{7}$ $2862 \div 45$ $63\frac{3}{5}$

㊴

5. $7\frac{1}{6} - 5\frac{1}{2} = 1\frac{2}{3}$ $6\frac{7}{12} - 2\frac{2}{3} = 3\frac{11}{12}$ $8\frac{1}{10} - 4\frac{2}{5} = 3\frac{7}{10}$ $7\frac{5}{16} - 1\frac{5}{8} = 5\frac{11}{16}$ $4\frac{1}{12} - 3\frac{1}{3} = \frac{3}{4}$ $7\frac{13}{16} - 4\frac{7}{8} = 2\frac{15}{16}$ $9\frac{3}{10} - 8\frac{2}{5} = \frac{9}{10}$
6. $9\frac{1}{8} - 5\frac{3}{4} = 3\frac{3}{8}$ $7\frac{1}{16} - 5\frac{3}{8} = 1\frac{11}{16}$ $5\frac{5}{12} - 2\frac{3}{4} = 2\frac{2}{3}$ $9\frac{1}{10} - 1\frac{3}{5} = 7\frac{1}{2}$ $6\frac{3}{16} - 5\frac{5}{8} = \frac{9}{16}$ $3\frac{1}{10} - 2\frac{1}{2} = \frac{3}{5}$ $5\frac{1}{16} - 4\frac{1}{2} = \frac{9}{16}$
7. $8\frac{5}{8} - 7\frac{3}{4} = \frac{7}{8}$ $7\frac{3}{16} - 6\frac{1}{2} = \frac{11}{16}$ $9\frac{1}{16} - 7\frac{3}{4} = 1\frac{5}{16}$ $8\frac{1}{12} - 6\frac{1}{6} = 1\frac{11}{12}$ $8\frac{5}{16} - 1\frac{7}{8} = 6\frac{7}{10}$ $7\frac{1}{10} - 3\frac{1}{5} = 3\frac{9}{10}$ $8\frac{1}{2} - 3\frac{2}{3} = 4\frac{5}{6}$
8. $4\frac{1}{8} - 1\frac{1}{4} = 2\frac{7}{8}$ $9\frac{7}{12} - 3\frac{5}{6} = 5\frac{3}{4}$ $6\frac{3}{10} - 4\frac{4}{5} = 1\frac{1}{2}$ $6\frac{5}{12} - 1\frac{5}{6} = 4\frac{7}{12}$ $5\frac{3}{16} - 3\frac{7}{8} = 1\frac{5}{16}$ $3\frac{5}{16} - 1\frac{1}{2} = 1\frac{13}{16}$ $8\frac{3}{10} - 5\frac{3}{5} = 2\frac{7}{10}$

㊵

9. $7\frac{1}{3} - 2\frac{5}{6} = 4\frac{1}{2}$ $4\frac{1}{4} - 2\frac{5}{8} = 1\frac{5}{8}$ $8\frac{1}{2} - 5\frac{9}{10} = 2\frac{3}{5}$ $2\frac{3}{4} - 1\frac{15}{16} = \frac{13}{16}$ $7\frac{1}{3} - 4\frac{5}{12} = 2\frac{11}{12}$ $6\frac{5}{8} - 5\frac{15}{16} = \frac{11}{16}$ $9\frac{1}{2} - 4\frac{11}{12} = 4\frac{7}{12}$
10. $8\frac{1}{4} - 2\frac{3}{8} = 5\frac{7}{8}$ $9\frac{1}{2} - 2\frac{3}{4} = 6\frac{3}{4}$ $5\frac{3}{4} - 3\frac{13}{16} = 1\frac{15}{16}$ $6\frac{1}{5} - 4\frac{7}{10} = 1\frac{1}{2}$ $9\frac{5}{6} - 6\frac{11}{12} = 2\frac{11}{12}$ $4\frac{1}{4} - 1\frac{7}{16} = 2\frac{13}{16}$ $6\frac{3}{8} - 3\frac{11}{16} = 2\frac{11}{16}$
11. $6\frac{1}{2} - 3\frac{5}{6} = 2\frac{2}{3}$ $5\frac{1}{2} - 1\frac{5}{8} = 3\frac{7}{8}$ $7\frac{1}{3} - 6\frac{7}{12} = \frac{3}{4}$ $3\frac{1}{2} - 2\frac{15}{16} = \frac{9}{16}$ $6\frac{3}{4} - 2\frac{11}{12} = 3\frac{5}{6}$ $8\frac{3}{5} - 6\frac{9}{10} = 1\frac{7}{10}$ $9\frac{1}{4} - 8\frac{15}{16} = \frac{5}{16}$
12. $5\frac{1}{2} - 3\frac{7}{8} = 1\frac{5}{8}$ $4\frac{2}{3} - 2\frac{5}{6} = 1\frac{5}{6}$ $8\frac{1}{5} - 4\frac{3}{10} = 3\frac{9}{10}$ $6\frac{1}{3} - 3\frac{11}{12} = 2\frac{5}{12}$ $7\frac{1}{4} - 1\frac{9}{16} = 5\frac{11}{16}$ $9\frac{1}{2} - 5\frac{7}{12} = 3\frac{11}{12}$ $5\frac{2}{5} - 4\frac{9}{10} = \frac{1}{2}$

More Practice

㊶

1. $\frac{2}{3}$ of 135	90	$\frac{3}{4}$ of 264	198	$\frac{4}{5}$ of 160	128	$\frac{2}{3}$ of 279	186
2. $\frac{5}{6}$ of 216	180	$\frac{2}{5}$ of 375	150	$\frac{3}{8}$ of 544	204	$\frac{3}{5}$ of 280	168
3. $\frac{3}{5}$ of 235	141	$\frac{5}{8}$ of 328	205	$\frac{4}{5}$ of 465	372	$\frac{7}{8}$ of 136	119
4. $\frac{3}{4}$ of 192	144	$\frac{2}{5}$ of 190	76	$\frac{5}{8}$ of 280	175	$\frac{5}{6}$ of 546	455
5. $\frac{3}{8}$ of 184	69	$\frac{5}{6}$ of 300	250	$\frac{2}{3}$ of 186	124	$\frac{7}{8}$ of 720	630

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6. $\frac{7}{8} \times 64$	56	$\frac{4}{5} \times 80$	64	$\frac{3}{4} \times 56$	42	$\frac{5}{8} \times 248$	155	$\frac{3}{8} \times 176$	66
7. $\frac{3}{5} \times 75$	45	$\frac{2}{3} \times 81$	54	$\frac{7}{8} \times 24$	21	$\frac{2}{5} \times 140$	56	$\frac{2}{3} \times 204$	136
8. $\frac{2}{3} \times 54$	36	$\frac{5}{8} \times 40$	25	$\frac{4}{5} \times 70$	56	$\frac{7}{8} \times 144$	126	$\frac{5}{6} \times 252$	210
9. $\frac{7}{8} \times 88$	77	$\frac{2}{5} \times 85$	34	$\frac{5}{8} \times 64$	40	$\frac{3}{4} \times 188$	141	$\frac{4}{5} \times 250$	200
10. $\frac{2}{5} \times 90$	36	$\frac{7}{8} \times 72$	63	$\frac{3}{5} \times 55$	33	$\frac{4}{5} \times 175$	140	$\frac{7}{8} \times 256$	224
11. $\frac{3}{8} \times 32$	12	$\frac{5}{6} \times 96$	80	$\frac{3}{8} \times 80$	30	$\frac{2}{3} \times 936$	624	$\frac{5}{8} \times 296$	185
12. $\frac{3}{5} \times 65$	39	$\frac{7}{8} \times 56$	49	$\frac{2}{5} \times 95$	38	$\frac{3}{5} \times 245$	147	$\frac{2}{3} \times 267$	178

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13. $1\frac{1}{2} \times 38$	57	$3\frac{4}{5} \times 55$	209	$14\frac{7}{8} \times 88$	1309	$2\frac{1}{3} \times 126$	294
14. $7\frac{3}{4} \times 44$	341	$1\frac{1}{8} \times 96$	108	$11\frac{1}{5} \times 70$	784	$7\frac{4}{5} \times 150$	1170
15. $9\frac{1}{8} \times 48$	438	$4\frac{3}{8} \times 56$	245	$10\frac{3}{5} \times 90$	954	$1\frac{1}{4} \times 200$	250
16. $4\frac{1}{5} \times 45$	189	$1\frac{5}{6} \times 90$	165	$13\frac{1}{6} \times 84$	1106	$2\frac{3}{8} \times 192$	456
17. $1\frac{1}{3} \times 39$	52	$2\frac{3}{4} \times 76$	209	$12\frac{2}{5} \times 95$	1178	$6\frac{1}{3} \times 162$	1026
18. $3\frac{2}{5} \times 60$	204	$8\frac{1}{2} \times 42$	357	$15\frac{5}{8} \times 40$	625	$2\frac{2}{3} \times 240$	640
19. $2\frac{1}{6} \times 72$	156	$3\frac{7}{8} \times 64$	248	$16\frac{3}{4} \times 84$	1407	$4\frac{5}{8} \times 232$	1073
20. $3\frac{2}{3} \times 51$	187	$1\frac{3}{5} \times 85$	136	$10\frac{1}{4} \times 72$	738	$2\frac{5}{6} \times 138$	391
21. $4\frac{5}{6} \times 30$	145	$4\frac{1}{4} \times 48$	204	$12\frac{1}{2} \times 60$	750	$8\frac{2}{3} \times 297$	2574

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1.	7.4	8.8	72.4	36.6	42.3	573.8
	+3.8	−2.4	−63.8	+34.9	−28.4	+135.8
	11.2	6.4	8.6	71.5	13.9	709.6
2.	6.2	2.3	99.7	72.9	86.6	532.2
	+5.9	+5.2	−36.9	−27.2	+44.1	−192.5
	12.1	7.5	62.8	45.7	130.7	339.7
3.	7.4	4.7	37.6	46.6	83.8	448.9
	−5.7	+6.6	+27.7	−35.7	−83.1	+246.6
	1.7	11.3	65.3	10.9	0.7	695.5
4.	9.5	9.4	25.4	38.7	65.7	818.7
	+2.8	−3.5	+23.9	+45.9	−39.8	−659.7
	12.3	5.9	49.3	84.6	25.9	159.0

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5.	.66	1.65	0.27	50.43	62.30	298.76
	−.29	+4.79	+4.55	−26.57	−45.37	+314.22
	.37	6.44	4.82	23.86	16.93	612.98
6.	.75	8.07	4.58	18.25	49.73	120.43
	−.47	−2.63	+4.02	+12.77	+14.68	−75.69
	.28	5.44	8.60	31.02	64.41	44.74
7.	.15	2.63	0.39	59.59	55.85	886.30
	+.36	+3.29	−0.17	+23.48	−35.78	−746.64
	.51	5.92	0.22	83.07	20.07	139.66
8.	.72	1.49	0.59	28.14	29.35	400.18
	−.34	+2.57	+0.79	−11.36	−25.89	+127.79
	.38	4.06	1.38	16.78	3.46	527.97

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9.	$\frac{1}{2} + \frac{5}{8}$ $1\frac{1}{8}$	$4\frac{1}{4} - 2\frac{3}{4}$ $1\frac{1}{2}$	$3\frac{5}{6} \times 42$ 161	$\frac{9}{10} + 1\frac{3}{5}$ $2\frac{1}{2}$
10.	$\frac{5}{6} - \frac{1}{6}$ $\frac{2}{3}$	$3\frac{1}{2} \times 24$ 84	$1\frac{1}{6} + 2\frac{2}{3}$ $3\frac{5}{6}$	$4\frac{5}{8} - 1\frac{5}{8}$ 3
11.	$\frac{2}{3} \times 9$ 6	$\frac{9}{16} + 1\frac{7}{8}$ $2\frac{7}{16}$	$4\frac{1}{2} - 2\frac{1}{5}$ $2\frac{3}{10}$	$1\frac{2}{3} + 1\frac{2}{3}$ $3\frac{1}{3}$
12.	$\frac{2}{3} - \frac{1}{4}$ $\frac{5}{12}$	$1\frac{3}{4} \times 16$ 28	$2\frac{1}{2} + 5\frac{1}{2}$ 8	$2\frac{4}{5} \times 20$ 56
13.	$\frac{1}{2} \times 8$ 4	$2\frac{5}{6} + \frac{11}{12}$ $3\frac{3}{4}$	$3\frac{7}{8} - 1\frac{3}{4}$ $2\frac{1}{8}$	$1\frac{7}{8} \times 32$ 60
14.	$\frac{3}{4} + \frac{3}{4}$ $1\frac{1}{2}$	$4\frac{3}{8} - \frac{13}{16}$ $3\frac{9}{16}$	$2\frac{3}{8} \times 64$ 152	$7\frac{1}{6} - \frac{7}{12}$ $6\frac{7}{12}$

More Practice

47

Find the perimeters of these rectangles:

1. 20 ft. by 24 ft. 88 ft. 12 in. by 15 in. 54 in. 8 yd. by 15 yd. 46 yd.
2. 80 ft. by 95 ft. 350 ft. 22 in. by 25 in. 94 in. 5 yd. by 11 yd. 32 yd.
3. 62 ft. by 78 ft. 280 ft. 36 in. by 48 in. 168 in. 9 yd. by 20 yd. 58 yd.
4. 13 ft. by 19 ft. 64 ft. 25 in. by 40 in. 130 in. 4 yd. by 16 yd. 40 yd.
5. 25 ft. by 25 ft. 100 ft. 20 in. by 30 in. 100 in. 7 yd. by 19 yd. 52 yd.
6. 28 ft. by 32 ft. 120 ft. 15 in. by 42 in. 114 in. 3 yd. by 12 yd. 30 yd.

48

Find the areas of these rectangles:

7. 2 ft. by 7 ft. 14 sq. ft. 11 ft. by 17 ft. 187 sq. ft. 30 ft. by 40 ft. 1200 sq. ft.
8. 4 ft. by 5 ft. 20 sq. ft. 14 ft. by 18 ft. 252 sq. ft. 35 ft. by 55 ft. 1925 sq. ft.
9. 9 ft. by 9 ft. 81 sq. ft. 15 ft. by 24 ft. 360 sq. ft. 40 ft. by 60 ft. 2400 sq. ft.
10. 5 ft. by 8 ft. 40 sq. ft. 18 ft. by 20 ft. 360 sq. ft. 46 ft. by 84 ft. 3864 sq. ft.
11. 7 ft. by 9 ft. 63 sq. ft. 10 ft. by 10 ft. 100 sq. ft. 20 ft. by 25 ft. 500 sq. ft.
12. 3 ft. by 8 ft. 24 sq. ft. 12 ft. by 18 ft. 216 sq. ft. 26 ft. by 38 ft. 988 sq. ft.

49

Find the areas of these rectangles:

13. 6 in. by 1 ft. 72 sq. in. 5 in. × 2 ft. 120 sq. in. 9 in. by 1 ft. 6 in. 162 sq. in.
14. 9 in. by 1 yd. 324 sq. in. 4 in. × 1 ft. 48 sq. in. 5 ft. by 3 yd. 2 ft. 55 sq. ft.
15. 4 ft. by 3 yd. 36 sq. ft. 2 ft. × 2 yd. 12 sq. ft. 2 ft. by 2 ft. 7 in. 744 sq. in.
16. 1 ft. by 6 yd. 18 sq. ft. 1 ft. × 5 yd. 15 sq. ft. 1 yd. by 3 yd. 2 ft. 33 sq. ft.
17. 2 ft. by 4 yd. 24 sq. ft. 7 in. × 1 ft. 84 sq. in. 8 in. by 1 ft. 2 in. 112 sq. in.
18. 8 in. by 2 ft. 192 sq. in. 9 in. × 2 ft. 216 sq. in. 1 ft. by 1 ft. 9 in. 252 sq. in.
19. 9 in. by 4 ft. 432 sq. in. 8 in. × 1 yd. 288 sq. in. 2 ft. by 1 yd. 1 ft. 8 sq. ft.

NUMBER RELATIONSHIPS

Certain helps are included in this book to aid in the mastery of the fundamental number facts. By using these number relationships the pupil can help himself when he forgets the answer to any fact. Pages 6 and 7 show ways the pupil can help himself to get the answer to an addition fact if he has forgotten it. Page 13 shows him how to get the answer to a subtraction fact by a process of thinking. Important aids in the learning of the multiplication facts are given on pages 19–23. Page 32 shows how the multiplication facts are used to aid in learning the division facts. These number relationships show that the pupil can relate unknown facts to those he already knows and thus reduce the amount of learning necessary to master the 390 fundamental number facts.

Number Facts. By the end of Grade 4 the pupils are expected to have a fair mastery of the 390 fundamental facts in addition, subtraction, multiplication, and division. In the early part of Grade 5 the pupils should be given the tests on pages 5, 12, 19, and 31 to see how well they know the fundamental number facts. A lack of mastery of any one or more of these facts may handicap a pupil's progress in arithmetic. Teachers should make every effort to discover the particular facts that each child has not mastered and give extra study to them. Facts with answers appear on pages 306–309.

The tests just mentioned are to be given orally to each individual pupil. As the pupil reads each fact on any test he gives *only the answer*. He should not say "4 times 6 are 24" but only "24." When the pupil takes one of these oral tests, the teacher should note all the facts for which the pupil gives unsatisfactory responses. At the end of the test the teacher should give the pupil a list of these particular facts, with instructions to study them carefully. An unsatisfactory response is one that is incorrect or one that is given with much hesitation, even though it is correct.

The time limit for each test is 3 to $3\frac{1}{2}$ minutes, depending upon the ability of the pupil and the part of the school year in which the test is given. If more time is required, it means that there are many facts which the pupil has not mastered. In giving each test it is as important to discover the delayed responses, even though they are correct, as it is to locate the incorrect ones. Written tests on the basic facts are not as satisfactory as oral tests since written tests do not indicate the delayed, though correct, responses. If the answers are written, the time should be extended to 5 or 6 minutes.

The tests mentioned above will probably show that the pupils make more errors on the multiplication facts than on the addition and subtraction facts. For this reason, special helps in learning the multiplication facts are given on pages 19–23. These helps are not a substitute for the memorization of these facts; their sole purpose is to provide an easy way to get the correct answer to a fact that has been forgotten. It is expected that after using these helps a short time the pupil will then remember the correct answer. If the pupil forgets the answer to a division fact, he can get it quickly by relating the division fact to the corresponding multiplication fact, as explained on page 32. A pupil should have no trouble with the division facts if he knows the multiplication facts.

USE OF FOLDED PAPER FOR EXERCISE WORK

To avoid copying exercises in addition and subtraction, such as those in ex. 10 and 11 on page 8 and in ex. 7 to 9 on page 14, the pupil may write the answers on folded paper as follows: The pupil places the edge of a sheet of paper under ex. 10 on page 8, writing the answers along the edge of the paper. When ex. 10 is finished, the answers should be folded under; the answers to ex. 11 are then written along the folded edge, and so on. It will save time to fold the paper in advance, each fold being about 1 inch wide. The answers to any exercises in addition and subtraction may be written on folded paper if the teacher wishes.

PROVISION FOR INDIVIDUAL DIFFERENCES AND REVIEW

Timed Tests. As the pupil progresses from grade to grade it is reasonable to expect that there will be a gradual improvement in the speed and accuracy of his computing, particularly with whole numbers. It seems important, therefore, beginning with Grade 5, to give timed tests about once a week to determine whether each pupil is acquiring that skill in computing that is desirable at the fifth grade level. Such tests are provided on pages 71, 103, 131, 165, 221, 253, and 299 of this book.

The method of giving one of these timed tests, such as the Addition Test on page 71, is as follows:

(1) Start all the pupils at the same time by saying "Go." Stop all pupils promptly at the end of 5 min., which is the time assigned for the Addition Test. Use a watch with a second hand to keep the time. For addition and subtraction tests the answers should be written along the edge of a sheet of folded paper, as described above on this page.

(2) Read the answers to the exercises. Then have each pupil count the number of exercises he has right. A partially completed exercise does not count.

(3) If the pupil has failed to finish the test within the time allowed, or if he has one third or more of the answers wrong, he needs more practice on such work. The teacher can assign practice, according to individual needs, from exercises in this book.

The time allowed for each test is a reasonable one. If the pupil has had sufficient practice in the fundamental operations, he should have no difficulty in completing any test in the assigned time, without hurry or nervousness. In giving these tests the teacher should not permit the pupils to consider them as a "race" to see who finishes first. Such a spirit of competition would defeat the purpose of the tests by overemphasizing the time element. These tests merely serve to determine whether individual pupils can add, subtract, multiply, and divide with accuracy within a reasonable amount of time.

The fact that four tests appear on page 71 and on other such pages does not mean that all four tests are to be given the same day. Not more than one timed test should be given on any day. The 28 timed tests in this book will be sufficient to give one of these tests about once a week.

The writing of answers on folded paper applies only to tests on addition and subtraction. For tests on multiplication and division, the exercises should be copied on a sheet of paper *before* the test is given. In copying the exercises the pupil should spread them over the sheet to allow ample space for the work.

More Practice. Pages 310–326 of this book give supplementary practice material that can be used in several ways as the teacher sees fit. References to these sets of exercises have been made on certain pages of the text where it is possible that more practice of a given type may be needed. The teacher can decide when to use this material. The supplementary exercises can also be used for the purpose of review on any given topic where review is desired.

Additive Method of Subtraction. This work is for teachers who use the additive method of subtraction. The basic idea of additive subtraction is to find a number to add to the lower number (subtrahend) to make the top number (minuend). Borrowing is not required in this method and for that reason the additive method is often easier for pupils to learn than the take-away method. The number of the page where subtraction of whole numbers is taught is given below. The model example is explained by the additive method of subtraction.

$$\begin{array}{r}2050\\ \underline{1375}\\ 675\end{array}$$

Page 14. You have learned that you can subtract 1375 from 2050 by adding enough to 1375 to make 2050. Think, "5 + 5 = 10." Write 5 in ones place. Add 1 ten to 7 tens, making 8 tens. Think, "8 + 7 = 15." Write 7 in tens place. Add 1 hundred to 3 hundreds, making 4 hundreds. Think, "4 + 6 = 10." Write 6 in hundreds place. Add 1 thousand to 1 thousand, making 2 thousands. Think, "2 + 0 = 2." Do not write 0 because there are no more figures to subtract. Check: 675 + 1375 = 2050.

Index

Addends, 8
Addition, by endings, 7, 8, 286
  checking, 8
  facts, 5–7, 306
  helps in, 6, 7, 9
  number relationships in, 6, 7
  of decimals, 230, 232, 236, 237, 294
  of dollars and cents, 16, 53, 68, 139, 197, 286
  of fractions, 113, 116, 117, 124, 125, 188–191, 200, 208
  of whole numbers, 8, 139, 286
  one hundred facts in, 5, 306
  terms used in, 8
Area of a rectangle, 266–269, 272–274
Averages, 58, 59

Bar graphs, 244–247, 263

Change, making, 10, 11
Checking, with decimals, 230–237
  with fractions, 124, 125, 127, 130, 217–220
  with whole numbers, 8, 14, 33, 37, 66
Circle, 276
Coins, 10, 11
Counting, 82, 104, 140, 143, 194, 202, 275

Decimal point, 37, 50, 90, 164, 220, 226
Decimals, addition of, 230, 232, 236, 237, 294
  changing fractions to, 228, 229
  changing to fractions, 228
  meaning of, 225–229, 234
  mixed, 227
  place value in, 226, 227
  reading and writing, 227, 228
  subtraction of, 230, 233, 236, 237, 294
Denominator, 111
  common, 189, 200
Diagnostic tests, in decimals, 256, 302
  in fractions, 74, 134, 224, 303
  in whole numbers, 5, 12, 18, 19, 31, 41, 44, 74, 108, 182, 302
Difference, 14
Dividend, 33, 78
Division, checking, 33, 37, 78, 84, 90
  even facts in, 31, 32, 309
  helps in, 32, 38, 39
  how multiplication helps, 32
Division (continued)
  long form of, 35
  ninety even facts in, 31, 309
  number relationships in, 32
  of dollars and cents, 37, 40, 90, 164, 175, 178
  readiness for long, 77
  remainders in, 34, 35, 78, 166
  terms used in, 33, 78
  uneven facts in, 34, 289
  ways of expressing, 62
  with one-place divisors, 33–35, 37
  with two-place divisors, 78–81, 84–86, 94, 95, 98–101, 105, 153–157, 159, 164, 166–169, 171, 173–175, 178, 289
  zeros in, 171, 173
Divisor, 33, 78
Dollars and cents, addition of, 16, 53, 68, 139, 197, 286
  division of, 37, 40, 90, 164, 175, 178
  multiplication of, 24, 40, 48, 50, 69, 219, 220
  subtraction of, 16, 53, 68, 141, 277
Dry measure, 96, 97

Estimating answers, 151, 152, 252

Facts with answers, 306–309
Folded paper, use of, 328
Fractional parts, 61, 217–220
Fractions, addition of, 113, 116, 117, 124, 125, 188–191, 200, 208
  changing decimals to, 228
  changing to decimals, 228, 229
  changing to lowest terms, 123, 211
  common, 225, 226
  decimal, 225, 226
  equal, 114, 186, 187
  improper, 122, 123
  in the quotient, 63, 64, 123, 211, 289
  lowest terms of, 115
  meaning of, 60, 62, 111, 112, 114, 122, 186, 187
  proper, 122
  subtraction of, 119, 120, 195, 196, 201, 203, 204, 206, 207, 214–216
  terms of, 111

Geometric figures, 265, 276
Graphs, bar, 244–247, 263

Hundreds, 137, 146, 147, 226
Hundredths, 226–228, 234

Interests of pupils, buying, 9–11, 15, 16, 25, 37, 38, 41, 43, 49, 52, 53, 59, 63, 68, 70, 72, 73, 77, 81, 91, 99–102, 105–107, 109, 110, 117, 121, 125, 128, 129, 133, 140, 141, 148, 151, 152, 155, 164, 168, 169, 172, 181, 193, 198, 205, 210, 217–220, 223, 250, 252, 288, 291, 293, 294, 296, 298, 301
  clubs, 47, 100, 102, 159, 167, 192, 216, 231, 232, 250, 279, 296, 298
  games and play, 26, 104, 139, 160, 161, 163, 249, 267
  making things, 25, 43, 53, 55, 91, 106, 116, 125, 126, 128, 142, 149, 152, 157, 168, 169, 181, 190, 200, 211, 250, 261, 262, 295, 297
  parties, picnics, trips, 17, 45, 46, 53, 54, 61, 64, 73, 79, 80, 90, 94, 99, 106, 120, 121, 124, 127, 129, 133, 149, 152, 155, 158, 166, 167, 179, 193, 198, 205, 207, 210, 216, 223, 231–233, 237, 238, 243, 250, 255, 271, 279, 288, 296
  saving, 15, 40, 43, 59, 70, 73, 99, 102, 104, 105, 107, 121, 142, 149, 151, 175, 193, 243, 288, 291, 294, 300, 301
  school, 1, 2, 17, 33, 43, 67, 73, 79, 91, 94, 95, 107, 110, 116, 119, 121, 124, 132, 141, 142, 152, 155, 157, 158, 162, 167, 170, 172, 190, 209, 244–246, 250, 263, 264, 272, 274, 284, 288, 295, 298
  selling, 9, 15, 28, 38, 48, 59, 67, 79, 80, 86, 96, 99, 101, 102, 105, 106, 109, 110, 121, 133, 148, 167, 179, 181, 193, 198, 220, 244–246, 255, 288, 301
  vacations, 34, 45, 46, 64, 68, 91, 107, 121, 125, 128, 141, 159, 161, 177, 231, 243, 280, 293
  working and earning, 9, 10, 40, 52, 55, 58, 68, 72, 83, 84, 91, 95, 96, 102, 129, 149, 157, 181, 183, 184, 193, 207, 220, 250, 255, 263, 297, 298, 301

Length, measures of, 27
Liquid measures, 54

Magic squares, 26, 163, 249
Measures (*see* Tables)
Millions, 138
Minuend, 14
Mixed number, 117, 123
Mixed practice, 16, 29, 40, 49, 56, 65, 87, 92, 110, 118, 130, 143, 162, 176, 185, 194, 197, 209, 239, 242, 243, 251, 270, 277, 290, 300
Multiplicand, 24
Multiplication, by 10 and 100, — 51
  checking, 24, 47, 66
  easy method of, 28
  facts, 19–23, 104, 308
  helps in, 19–23, 25
  number relationships in, 19–23
  of dollars and cents, 24, 40, 48, 50, 69, 219, 220
  of whole numbers, 24, 47, 50, 66, 67, 148, 287
  one hundred facts in, 19, 308
  terms used in, 24, 47
  zeros in, 19, 51, 69
Multiplier, 24

Numbers, meaning of, 1–3, 137, 138, 146, 147, 225, 226
  mixed, 117, 123
  reading and writing, 2, 3, 138, 227, 228
  Roman, 144–147, 180
  round, 4, 150
  whole, 1–3, 117, 123, 137, 138
Numerator, 111

Perimeter, 261, 262, 269
Place value, 1–3, 137, 138, 146, 147, 226
Practice pages, extra, 310–326
Problem solving, helps in, 9, 15, 25, 38, 39, 58, 59, 88, 89
Problem tests, 43, 73, 107, 133, 181, 223, 255, 301
Problems, in decimals, 231–233, 235–238, 254, 294
  in fractions, 116, 124–129, 162, 190, 192, 196, 207, 208, 216, 218–220
  mixed, 17, 40, 43, 45, 46, 53, 55, 68, 73, 75, 76, 83, 91, 102, 107, 109, 110, 121, 133, 135, 136, 142, 149, 151, 152, 160, 161, 177, 179, 181, 183, 184, 205, 209, 212, 213, 223, 240, 241, 250, 252, 255, 257–259, 263, 271, 282, 283, 288, 291, 293, 295, 298, 301
  on measures, 54, 96, 97, 158, 261, 262, 264, 266–269, 272–274, 281, 297
  two-step, 52, 53, 102
  with extra data, 68, 209, 296
  with missing data, 271, 298

Problems (continued)
  without numbers, 57, 170, 198, 271
  without questions, 193
Product, 24, 47
Projects, 1, 17, 28, 45, 46, 55, 58, 75–77, 83, 96, 97, 109, 135, 136, 160, 161, 168, 169, 177, 183, 184, 192, 205, 212, 213, 218, 232, 238, 240, 241, 257–259, 263, 278–280, 282–284
Promotion test, 304

Quotient, 33, 34, 78

Rectangle, 260, 265
Relationships, number, 6, 7, 13, 19–23, 32
Remainder, in division, 34, 35, 78, 166
  in subtraction, 14
Remedial practice, 310–326
Reviews, chapter, 42, 72, 106, 132, 180, 222, 254
  oral, 36, 70, 82, 92, 140, 172, 202, 248, 275, 281, 292
  written, 16, 29, 40, 48, 49, 56, 65, 87, 91, 92, 99, 101, 110, 118, 121, 126, 127, 130, 143, 148, 149, 162, 185, 194, 197, 209, 210, 239, 242, 243, 250, 270, 277, 286–291, 293–295, 297, 300
Right angle, 260, 265
Roman numerals, 144–147, 180
Round numbers, 4, 150

Scale drawing, 278–280, 284, 285
Square, 260, 265
Square measure, 265–269, 272–274
Subtraction, additive method, 329
  checking, 14
  facts, 12, 13, 307
  helps in, 13, 15
  how addition helps, 13
Subtraction (continued)
  of decimals, 230, 233, 236, 237, 294
  of dollars and cents, 16, 53, 68, 141, 277
  of fractions, 119, 120, 195, 196, 201, 203, 204, 206, 207, 214–216
  of whole numbers, 14, 141, 287
  one hundred facts in, 12, 307
  terms used in, 14
Subtrahend, 14
Suggestions to teachers, 327, 328
Sum, 8

Tables, of dry measure, 96, 305
  of linear measure, 27, 305
  of liquid measure, 54, 305
  of square measure, 274, 305
  of time, 93, 305
  of weight, 30, 305
Tens, 146, 147, 226
Tenths, 225–227
Tests, diagnostic, 5, 12, 18, 19, 31, 41, 44, 74, 108, 134, 182, 224, 256, 302, 303
  problem, 43, 73, 107, 133, 181, 223, 255, 301
  promotion, 304
  timed, 71, 103, 131, 165, 221, 253, 299
Thousand, 1–3, 137, 138
Time, measures of, 93
Time, rate, distance, 88, 89
Triangle, 276

Vocabulary exercises, 29, 57, 170, 199, 252, 296

Weight, measures of, 30

Zero, as place holder, 146, 147
  in division, 171, 173
  in multiplication, 19, 51, 69

CXIV

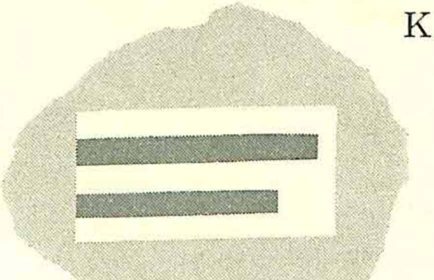
Teacher's Guide and Key for

ACHIEVING GOALS

American Arithmetic
Second Edition
Grade 5

$A = lw$

CLIFFORD B. UPTON
KENNETH G. FULLER



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EP 10 9 8 7 6 5 4 3 2 1

Use of This Guide. This guide, together with the Upton-Fuller *American Arithmetic, Second Edition, Grade 5, Achieving Goals,* offers to the teacher a course in modern methods of teaching arithmetic in Grade 5. The Guide presents the principles of teaching, while *American Arithmetic, Grade 5* illustrates these principles through the actual materials of instruction. This combination provides a more comprehensive discussion of arithmetic methods than is found in most methods books.

The Guide gives suggestions and helps on the teaching of each page of *American Arithmetic, Grade 5* and often refers to specific exercises in the text. To use the Guide successfully, you should study carefully each text exercise or explanation to which reference is made in the Guide.

Since a thorough acquaintance with a textbook helps the teacher in using that textbook effectively, certain outstanding features of this series of books, and of *American Arithmetic, Grade 5* in particular, are given below.

Philosophy Underlying These Books. The objectives of *American Arithmetics* are simply stated:

(1) To teach pupils properly to interpret and to solve the problems of everyday life that involve quantitative data

(2) To teach pupils to understand our number system and the four fundamental processes with whole numbers, fractions, and decimals

(3) To develop in pupils sufficient skill in computation to enable them to solve the problems of everyday life with reasonable speed and accuracy

The attainment of these objectives comes *through insight and intelligent understanding* rather than through the blind following of rules and mechanical procedures.

Meaning and Understanding. Meaning and understanding in arithmetic go much farther than using objects in the primary grades to make number meaningful, or explaining the process of regrouping in subtraction. Meaning and understanding, properly treated, must pervade all the work in arithmetic throughout the elementary school. The constant aim of this series of texts is to teach arithmetic so that the pupils understand and enjoy it. Throughout these books special attention is given to the following features:

1. Basic Concepts and Terms of Arithmetic. The meanings of fundamental concepts relating to whole numbers, fractions, and decimals, as well as the definitions of the technical terms of arithmetic, are explained with unusual clarity.

2. Comprehension of the Fundamental Processes. This feature includes clear explanations of such topics as long division, the addition of unlike fractions, and the finding of a fractional part of a whole number.

3. Meaningful Processes through Motivating Problems. In these arithmetics each new topic or process is made meaningful through a motivating problem related to the interests of the pupils. This method shows why the new process is needed.

4. Fundamental Principles. Fundamental principles of arithmetic are simply explained and applied throughout this series of books. These principles replace arbitrary rules.

5. Meaningful Problems. All problems and projects relate to the interests and experiences of children and are written in language that they can understand.

6. Our Number System. The principles underlying our number system are emphasized in each book of this series.

Number Relationships. The fundamental number facts in addition, subtraction, multiplication, and division are the *foundation stones* of all arithmetic. These facts are supposed to be learned in Grades 3 and 4, but in every school one still finds in Grades 5 through 8 pupils who are not sure that 8 and 9 are 17 or that 7 times 9 equals 63. Defects like these are a serious hindrance to all the subsequent work in arithmetic.

In an attempt to remedy this situation, *American Arithmetics* taught the fundamental number facts in Grades 3 and 4 by the use of number relationships. The procedure by which this teaching was accomplished is fully explained in *American Arithmetic, Grade 3* and *American Arithmetic, Grade 4*, and also in the *Teacher's Guides* for these two grades. You should refer to this work, particularly for suggestions on remedial work for the addition and subtraction facts. For remedial work on the multiplication and division facts, for which there is usually a great need, you should study the interesting new number relationships which are presented on pages 20–23 and 32 of *American Arithmetic, Grade 5.* The pupils will find these relationships a delightful arithmetic recreation as well as a very effective aid in memorizing the facts they do not know.

Problem Solving and Projects. The problems in *American Arithmetic, Grade 5* stress one-step and two-step problems and are related to the interests of boys and girls. There are many helps in problem solving. See pages 25, 38, 52, 57, 58, 68, 88, 89, 193, 209, 271, 296, and 298.

Also provided are many challenging projects in which arithmetic is correlated in interesting ways with history, geography, science, agriculture, and transportation. See pages 45–46, 75–76, 135–136, 170, 192, 212–213, 234–236, 240–241, 257–259, and 282–283.

Long Division. The most important new topic in Grade 5 is long division, which is by far the most difficult operation with whole numbers. The term *long division* refers to examples in which the divisor is a number of two or more figures. In most textbooks long division is taught by a method which requires frequent correction of each quotient figure before the correct figure is found. An example of this inefficient way of doing long division is described below in Method A:

$$\begin{array}{r} 347 \\ 28\overline{)9734} \\ \underline{84} \\ 133 \\ \underline{112} \\ 214 \\ \underline{196} \\ 18 \end{array}$$

Method A. In the work at the right, each quotient figure is found by dividing each partial dividend by the *first figure of the divisor.* For example, to find the first quotient figure, you divide 9 by 2, which gives 4 as a trial quotient. Since 4 is too large, you then try 3, which is correct. To get the next quotient figure, you divide 13 by 2, getting 6, which is too large. You try 5, which is also too large. Then you try 4, which is correct. For the next quotient figure you divide 21 by 2, which gives 10; but no quotient figure can be larger than 9, so you try 9. You find that 9 is too large, so you try 8; 8 is also too large, so you try 7, which is correct. It should be noted that the correct quotient figure was obtained each time *only after two or three trials.*

By contrast, in *American Arithmetic, Grade 5* the pupils are taught to do the same example as shown below in Method B:

Method B. Instead of dividing each partial dividend by 2, divide in each case by 3, which is 1 *more than the first figure of the divisor.* In other words, you think of 28 as being close to 30; hence, you get each trial quotient figure by dividing by 3 instead of 2. To get the first quotient figure, divide 9 by 3; this gives 3, which is correct. To get the second quotient figure, divide 13 by 3; this gives 4, which is correct. To get the next quotient figure, divide 21 by 3; this gives 7, which is correct. By following this method, you see that the correct quotient figure is found each time *on the first trial.*

In the example shown, the divisor is 28. In the Upton-Fuller *American Arithmetics,* if the divisor were 26, 27, or 29 instead of 28, the example would be worked also by Method B, because each of these divisors is closer to 30 than to 20. In fact, for any 2-figure divisor having a second figure of 6, 7, 8, or 9, each quotient figure is estimated by dividing by 1 more than the first figure of the divisor. See page 153 of *American Arithmetic, Grade 5.* On the other hand, if the second figure of a 2-figure divisor is 1, 2, 3, 4, or 5, each quotient figure is estimated by dividing by the first figure of the divisor. See page 85 of the text. It is thus seen that the method of long division given in *American Arithmetic, Grade 5* finds each quotient figure by dividing by the *first figure* of the divisor when the divisor ends in 1, 2, 3, 4, or 5, and by dividing by 1 *more than the first figure* when the divisor ends in 6, 7, 8, or 9. This method of long division is very efficient since it gives the correct quotient figure *on first trial* in 80% of all cases; in the remaining 20% of cases, with minor exceptions, the correct quotient figure is found after a single correction. In other words, the necessity of correcting each quotient figure several times does not occur when long division is taught according to the method given in *American Arithmetic, Grade 5.* This method of long division is the result of years of research on the part of Professor Upton. The research was reported in detail in the *Tenth Yearbook of the National Council of Teachers of Mathematics* in an article entitled "Making Long Division Automatic."

Since long division is such a difficult topic, the various phases of this subject have been distributed over several chapters of *American Arithmetic, Grade 5,* rather than being concentrated in a single chapter. See pages 77–81, 84–86, 90, 94–95, 98–99, 100, 101, 153–157, 159, 166–167, 174–175, and 178 of the text.

Vocabulary and Language. Problems and explanations are written in simple language that children can understand. The vocabulary has been controlled with unusual care and contains a very high percentage of words given in authoritative word lists as suitable for Grade 5. The technical words of arithmetic are clearly defined and are reviewed in special exercises; see pages 8, 14, 24, 29, 57, 170, and so on.

Maintenance Program. Full provision has been made to maintain skills in computation and problem solving as follows:

1. **Reteaching of Important Topics.** Each book in this series devotes the first one or two chapters to a review and a reteaching of the important topics in the work of the preceding year.

2. **Diagnostic Tests.** Diagnostic tests with keyed references to remedial exercises are given at the end of each chapter. See pages 44, 74, 108, 134, 182, 224, 256, and 302–303 of *American Arithmetic, Grade 5.*

3. **Problem Tests.** A Problem Test designed to test the pupil's ability in problem solving is given in each chapter. See pages 43, 73, 107, 133, 181, 223, 255, and 301.

4. **Chapter Reviews.** Reviews covering the new work of each chapter are provided. See pages 42, 72, 106, 132, 180, 222, and 254.

5. **Oral and Written Reviews.** Reviews covering important topics previously taught are frequently given. For examples, see pages 16, 36, 49, 70, 82, 92, 101, 110, 118, 130, 140, 148, 162, 185, 210, 239, 242, 248, 286–295.

6. **Timed Tests.** Timed tests, to be given about once a week, are provided for use in determining whether the pupil is acquiring that skill in computing which is desirable at the fifth-grade level. See pages 71, 103, 131, 165, 221, 253, and 299.

7. **Mixed Practice.** Computational practice on the four fundamental processes is amply provided for. See pages 56, 65, 87, 143, 194, 197, 239, 243, and 251.

8. **Maintenance of Arithmetic Vocabulary.** Reviews which give an opportunity to check understanding of words essential to arithmetic are provided. See pages 29, 57, 170, 199, 252, and 296.

Use of the Textbook. Before starting the year's work, read "Suggestions to Teachers" on pages 327–329 of *American Arithmetic, Grade 5.* These suggestions contain valuable teaching hints and give various helps for teaching specific pages of the text.

In teaching *American Arithmetic, Grade 5*, follow the textbook, page by page, as it is written. Do not skip around in the book, teaching the topics in a different order from that in which they are now presented. The reason for this caution is that arithmetic is a *sequential subject:* each topic must be taught in its proper order because of the close dependence of the various topics one upon another. For example, the addition of fractions with like denominators must precede the addition of fractions with unlike denominators, the multiplication of fractions must come before the division of fractions, square measure must come before cubic measure, and so on. Teaching the successive topics in arithmetic is much like forging the links of a chain. If one of the links is defective, the chain breaks. If a child is absent from school when a certain topic is taught, he may be greatly handicapped when he returns to school, since the topic he missed may be essential to his understanding of the new work he is about to take up.

This emphasis on the importance of presenting the topics in their sequential order applies with particular force to arithmetic. Other school subjects, such as history, English, and geography, are not so highly sequential in nature as arithmetic. In geography, for example, if a pupil is absent from school when a study of the New England States is made, this absence does not handicap him in his study of the North Central States when he returns to school. On the other hand, the same absence from school may seriously affect his progress in arithmetic.

The fact that arithmetic is a sequential subject makes it very important for you to try to learn *at frequent intervals* the difficulties that each pupil is having, rather than to let these difficulties accumulate. By the aid of the diagnostic tests and other tests given in the textbook, find out each pupil's difficulties as the work progresses and take the necessary steps to correct them. This diagnostic work is especially necessary in the fifth grade because in this grade the pupil completes the four fundamental processes with whole numbers, including long division, and also makes a very substantial start in common fractions. With so many different skills to be kept straight, it is an easy matter for difficulties to arise. Unless these difficulties are promptly corrected, they will rapidly accumulate; and the pupil will become more uncertain of his arithmetic skills in each successive grade.

Key. All answers are given on the appropriate pages in the Guide. These answers will be a convenience for those teachers not using the annotated edition, who may prefer to transfer them to the textbook pages for ready reference. As a further convenience, two-part examples are worked out throughout the book.

Chapter 1

Aims of Chapter 1. The major aims of Chapter 1 are to reteach and review the basic skills in addition, subtraction, multiplication, and division of whole numbers as taught in *American Arithmetic, Grades 3* and *4*. Specifically, these aims are to:

1. Review basic addition, subtraction, multiplication, and division facts.
2. Reteach adding by endings.
3. Review column addition with and without carrying.
4. Review subtraction of numbers with and without regrouping.
5. Reteach measures of length and weight.
6. Review methods of making change.
7. Reteach multiplying by 1-figure numbers.
8. Reteach division by 1-figure numbers with and without remainders.
9. Review addition, subtraction, and multiplication thought patterns as they appear in word problems.
10. Reteach six division thought patterns as they appear in word problems.

Page 1

Aim: To reteach understanding and reading of large numbers

Suggestions: Local newspapers usually print many statistics concerning the opening day of school. This lesson may be continued by the pupil when he returns home from school and reads the afternoon paper. If there are no afternoon papers in your community, urge the pupils to bring morning papers to class the next day and to circle in red any numbers dealing with school statistics. This work can be extended to the finding and reading of other large numbers in the newspaper.

Key: **1.** 2974 − 1585 = 1389 (boys). **2.** 2 thousand, 9 hundred 74; 2 thousands, 9 hundreds, 7 tens, 4 ones. **3.** 2974 − 2296 = 678 (children). **4.** The number has 6 places and is read 223 thousand, 1 hundred 68. **5.** 77,157 + 19,398 + 15,538 + 14,635 + 14,071 = 140,799 (school children). **6.** 223,168 − 140,799 = 82,369 (school children).

Page 2

Aim: To reteach place value of 6-figure numbers

Suggestions: Ex. 1 reteaches the various ways the number 429367 can be read. Ex. 2 stresses the advantage of using a comma in reading large numbers. Ex. 6 illustrates the importance of understanding *place value* in using large numbers. Many teachers extend the exercises in the book by developing such questions as:

In the number 429367 —

how many tens are there in the number?	42936
how many hundreds in the number?	4293
how many thousands in the number?	429

Ex. 9 serves as an excellent evaluation of pupil mastery of place-value understanding.

Key: **3.** 4 thousand, 3 hundred 92 (4 thousands, 3 hundreds, 9 tens, 2 ones); 28 thousand, 3 hundred 75 (2 ten-thousands, 8 thousands, 3 hundreds, 7 tens, 5 ones); 33 thousand, 8 hundred 88 (3 ten-thousands, 3 thousands, 8 hundreds, 8 tens, 8 ones); 125 thousand, 6 hundred 47 (1 hundred-thousand, 2 ten-thousands, 5 thousands, 6 hundreds, 4 tens, 7 ones); 839 thousand, 4 hundred 16 (8 hundred-thousands, 3 ten-thousands, 9 thousands, 4 hundreds, 1 ten, 6 ones). **4.** 2 thousand, 40 (2 thousands, 4 tens); 49 thousand, 6 hundred 8 (4 ten-thousands, 9 thousands, 6 hundreds, 8 ones); 60 thousand (6 ten-thousands); 200 thousand, 9 hundred 34 (2 hundred-thousands, 9 hundreds, 3 tens, 4 ones); 529 thousand, 8 (5 hundred-thousands, 2 ten-thousands, 9 thousands, 8 ones).

7.
$$\begin{array}{r} 100{,}000 \\ 60{,}000 \\ 9{,}000 \\ 200 \\ 40 \\ 7 \\ \hline 169{,}247 \end{array}$$

8. 524,316 (524 thousand, 3 hundred 16); 21,385 (21 thousand, 3 hundred 85); 281,347 (281 thousand, 3 hundred 47); 28,000 (28 thousand); 50,950 (50 thousand, 9 hundred 50). **9.** 9999; 1000.

Page 3

Aim: To reteach the significance of zero as a place holder

Suggestions: One of the most important understandings connected with our number system is the use of zero as a place holder. In very early times, mathematicians did not have a zero to use as a place holder; and this lack handicapped their writing of large numbers. It was not until about the ninth or tenth century A.D. that zero came into use as a place holder. Before that time a space was left where the zero should have been written. Some pupils may enjoy looking up in the classroom encyclopedia the story of *zero* and reporting to the class on their findings. Ex. 1–4 provide practice in using and reading zero as a place holder. Ex. 5 tests again (as did ex. 9 on page 2) pupil understandings of our number system. Ex. 6 provides a natural step for the reteaching of rounding off numbers which follows on the next page.

Key: **1.** 9005. **2.** Nine thousand has 4 places; twenty-five thousand has 5 places. **3.** A zero; 5002; 6020. **4.** 6 thousand 39 (no hundreds); 1 thousand, 9 hundred 8 (no tens); 7 thousand, 4 (no hundreds or tens); 28 thousand, 73 (no hundreds); 53 thousand, 6 (no hundreds or tens); 30 thousand, 70 (no thousands, hundreds, or ones). **5.** 99,999; 999,999; 10,000; 100,000. **6.** 121,702; 83,406; 54,923; 51,428; 27,512; 25,508; 22,539; 17,483; 14,119; 12,252.

Page 4

Aim: To reteach rounding off large numbers

Suggestions: One of the secrets of mental estimation in arithmetic is the ability to round off numbers to tens and powers of tens. This lesson reorients the pupil in how to round off to the nearest ten, hundred, or thousand. Ex. 7 and 8 commonly occur in everyday living, and some teachers prefer to begin the work of this page with those examples.

Key: **1.** Three thousand is an easier figure to remember and use. **2.** 4000. **3.** The figure was nearer 200 than 300. **4.** Yes. **5.** 600; 800; 400; 800; 300; 500; 100. **6.** 8000; 7000; 2000; 5000; 8000; 9000. **7.** The price was closer to $5.00 than to $4.00. **8.** $9.00; $3.00; $20.00; $15.00; $5.00; $23.00; $10.00; $45.00. **9.** The price seems smaller.

Page 5

Aim: To test the pupils' mastery of the 100 addition facts

Suggestions: The 100 addition facts are probably the most used of all the number facts in arithmetic. These facts are supposed to have been learned thoroughly by the end of the third grade. You will find, however, that some pupils in the fifth grade have not fully mastered all these facts and that they continue to make mistakes in using them. One of the important things for you to do at the beginning of the fifth grade is to determine how well the pupils know these facts. This check can best be made by testing each pupil orally with reference to these facts. For suggestions for making such tests, see page 327 of the text.

You may prefer to make the oral tests on the 100 addition facts by means of flash cards, each card containing one fact. After you show a card to a pupil and get his response, place the card in one of three piles according to whether the response is satisfactory, delayed, or incorrect. The pupil is then instructed to practice on the cards in the "delayed" and "incorrect" piles. It is just as important to discover the delayed responses, even though they be correct, as it is to locate the incorrect ones, since a delayed correct response suggests that the pupil is counting to get the answer.

Key: **1.** 12; 7; 15; 12; 9; 8; 13; 4; 14; 11. **2.** 9; 7; 5; 12; 12; 11; 7; 15; 10; 3. **3.** 2; 14; 16; 9; 0; 5; 10; 6; 3; 4. **4.** 17; 11; 5; 8; 14; 2; 10; 4; 11; 8. **5.** 8; 10; 16; 12; 6; 13; 4; 12; 1; 13. **6.** 9; 15; 10; 7; 15; 7; 8; 10; 6; 7. **7.** 11; 6; 13; 3; 7; 18; 11; 2; 4; 17. **8.** 9; 1; 11; 6; 8; 13; 5; 3; 9; 9. **9.** 8; 5; 11; 13; 8; 7; 9; 10; 9; 10. **10.** 14; 14; 6; 8; 10; 9; 6; 16; 5; 12.

Pages 6–7

Aim: To review number relationships as a preparation for adding by endings

Suggestions: Adding by endings is a fundamental skill which the pupils must thoroughly understand and master if they are to succeed in column addition. To add a column of figures like the one at the right, you begin at the bottom and add 6 and 7, which gives 13. You then add 13 and 5, which gives 18. In this addition, the combination 6 + 7 is one of the 100 addition facts, but the combination 13 + 5 is something new. Each of the 100 addition facts, like 6 + 7, represents the adding of a 1-figure number to a 1-figure number.

$$\begin{array}{r} 5 \\ 7 \\ \underline{6} \end{array}$$

The new combination, 13 + 5, however, represents the adding of a 2-figure number to a 1-figure number. In column addition this adding *must always be done mentally*. This skill of adding *mentally* a 2-figure number to a 1-figure number is called *adding by endings*, or *higher decade addition*. The term "adding by endings" arises from the fact that the *end figures* are of basic importance in finding the sum. For example, in the exercise at the right, the sum 18 depends on the fact that the sum of the end figures is 8.

$$\begin{array}{r}5\\13\\\hline 18\end{array}$$

In adding a longer column of figures, like the one shown at the right, the work involves the use, in rapid succession, of several combinations in adding by endings. For example, to add this column requires the use of the fundamental fact 6 + 7 and of the following combinations in adding by endings: 13 + 5, 18 + 6, and 24 + 8.

$$\begin{array}{r}8\\6\\5\\7\\6\\\hline\end{array}$$

It is apparent, therefore, that in long columns of figures the number of facts requiring adding by endings will usually exceed the number of basic facts. Since work in Grades 5, 6, 7, and 8 will call for adding long columns of figures, it is the task of the fifth-grade teacher to be sure that the skill of adding by endings is thoroughly mastered. The examples on these pages offer suggestions for this reteaching program. Ex. 2 and 3 on page 6 reteach the commutative principle, as dealing with basic facts; and other suggestions for recalling basic facts are given in ex. 4–9 on the same page. Beginning with ex. 16 on page 7, the adding by endings practice begins.

Additional practice in adding by endings is easily provided through oral exercises in counting by 2's, 3's, 4's, 5's, and so on, beginning at different starting points. Examples of such exercises are given below.

(1) Beginning with 10, count by 3's to 46. Repeat, counting by 4's.

(2) Beginning with 11, count by 4's until you pass 50. Repeat, beginning with 8 and counting by 5's.

(3) Beginning with 12, count by 6's until you pass 50. Repeat, beginning with 3 and counting by 7's.

Many different exercises of the same kind can easily be made. In each case tell the pupil where to start and where to stop. In order to limit the length of each exercise, stop the counting as soon as the sum exceeds 50 or 60. A few minutes devoted to counting of this kind will be a valuable part of any oral review.

Key: **3.** 8 + 3; 7 + 4; 8 + 5. **4.** 8; 6; 10; 7; 9. **5.** 6; 9; 4; 0; 8. **7.** 14; 15; 15. **9.** Take 1 from 6 and add it to 9. You now have 10 + 5, or 15. **10.** 14; 12; 16; 11. **11.** Take 2 from 5 and add it to 8. You now have 10 + 3, or 13. **12.** 11; 17; 14; 12; 15. **13.** 11. **17.** 19; 27; 47; 69; 28; 38; 85; 78. **19.** 31; 25; 41; 92; 51; 31; 63; 70.

Page 8

Aim: To reteach column addition

Suggestions: Pupils are reminded to add up and check by adding down. Both column addition and horizontal addition are illustrated on this page. Since all these examples require a facility at adding by endings, be careful to analyze pupil errors to determine whether the mistake is caused by an inability to add by endings or by an uncertainty concerning the answers to the 100 basic addition facts which were tested on page 5.

Page 8 is the first page which refers to the "More Practice" pages. See page 329 of the text for an explanation of how to use these pages.

Workbook Reference: Upton-Uhlinger: Arithmetic Workshop, Book 5, page 2 (published by American Book Company)

Key: **2.** 269. **3.** 281. **4.** 200. **5.** 263. **6.** 340. **7.** 264. **8.** 262. **9.** 251. **10.** 1782; 1607; 2000; 2059; 2160; 1832; 15,875. **11.** 1915; 2422; 2075; 2176; 1590; 2057; 10,169. **12.** 39; 68; 31; 50; 36. **13.** 51; 81; 59; 26; 50. **14.** 87; 62; 74; 99; 96. **15.** 82; 102; 21; 83; 33.

Page 9

Aim: To reteach what addition really is

Suggestions: Addition is the *grouping together* of numbers of the same things. The sum is always larger than any one of the groups. The problem-solving situations listed on this page use these addition thought patterns:

How many in all?
How many all together?
How much did —— spend?

Key: **1.** 48 + 50 = 98 (cookies). **2.** 75 + 25 = 100 (stamps). **3.** 18 + 15 = 33 (tickets). **4.** \$.50 + \$.75 = \$1.25. **5.** 5 + 2 = 7 (strings of beads). **6.** 10¢ + 5¢ = 15¢. **7.** 17 + 24 + 14 = 55 (boxes).

Pages 10–11

Aim: To review change making as learned in Grade 4

Suggestions: When you make a purchase at a store, the clerk always makes change by a process of addition. If you buy something that costs 12¢ and give the clerk a quarter, the clerk thinks "12¢" and then adds coins, one by one, to 12¢ until he reaches a quarter. The clerk does not subtract 12¢ from 25¢, which gives 13¢, and then hand you 13¢. In reviewing change making, start with many oral exercises in which actual coins or toy money is used. Limit the amount of the purchase at first to amounts under 25¢ and assume that the amount handed the clerk is a quarter. After oral exercises in making change from a quarter, proceed to making change from a half dollar or a dollar. It is important to note that change making is a process of *successive additions* by which coins are added, one by one, to the amount of the purchase until the amount given the clerk is reached. This successive addition is *always done orally.*

The method used in making change is also the method that you should use in checking the change that the clerk gives you after you have made a purchase. If you have bought something that costs 8¢ and have given the clerk a quarter, he will hand you 2 pennies, a dime, and a nickel. You will check this change by adding the 2 pennies to 8¢, which gives 10¢; next add the dime, which gives 20¢; and then add the nickel, which gives 25¢. Since 25¢ is the amount you gave the clerk, the change is right. The process of checking change may be summarized as follows: *Start with the cost of your purchase and add to it the coins the clerk gives you. The sum should equal the amount that you gave the clerk.*

In making change you should use the least number of coins to give the required amount of change. For example, in making change for a purchase of 15¢ out of a half dollar, the change should be 1 dime and 1 quarter. The change would be correct, of course, if it were 1 nickel and 3 dimes, or 2 nickels and 1 quarter; but such combinations are not customary unless certain coins are not available.

Workbook Reference: Arithmetic Workshop, Book 5, page 3

Key: **2.** Bill made the change with a nickel and a quarter. First he said, "20." Then he handed Don a nickel and said, "25"; then he gave Don a quarter and said, "50." Bill gave Don 2 coins. **3.** Bill could have given Don 3 dimes. **4.** \$.19 + \$.33 = \$.52; "52, 55, 65, 75, one dollar." **5.** Yes; "30, 35, 40, 50, 75, one dollar." **6.** 1 cent, 1 quarter; 1 cent, 1 nickel, 2 dimes; 1 cent, 3 nickels, 1 dime; 1 cent, 5 nickels. **7.** Yes; to avoid having more pennies. **8.** 1 quarter, 2 cents; 1 nickel and 1 dime. **9.** 1 nickel. **10.** 20 nickels, 20 dimes, 8 quarters. **11.** 11¢ + 4¢ + 10¢ + 75¢ = \$1.00. **12.** 3 half dollars, 3 quarters, 3 dimes, 3 nickels, and 3 pennies; or \$1.50 + \$.75 + \$.30 + \$.15 + \$.03 = \$2.73.

Page 12

Aim: To test mastery of the 100 subtraction facts

Suggestion: The 100 basic subtraction facts are supposed to have been mastered in Grade 3. You may find, however, that some fifth-grade pupils still have difficulty with them. In giving this test, follow the suggestions given in this Guide for text pages 5 and 327.

Workbook Reference: Arithmetic Workshop, Book 5, page 4

Key: **1.** 4; 5; 6; 1; 2; 0; 7; 6; 9; 6. **2.** 4; 1; 7; 2; 4; 0; 4; 4; 4; 4. **3.** 0; 6; 4; 2; 4; 3; 8; 2; 8; 8. **4.** 5; 0; 1; 8; 2; 0; 9; 5; 5; 8. **5.** 7; 3; 1; 0; 6; 5; 9; 7; 5; 3. **6.** 3; 1; 2; 1; 5; 9; 5; 8; 3; 3. **7.** 1; 0; 5; 6; 2; 6; 7; 6; 5; 9. **8.** 1; 3; 3; 9; 2; 8; 7; 1; 9; 9. **9.** 0; 3; 4; 0; 7; 2; 7; 9; 6; 9. **10.** 8; 0; 1; 3; 2; 6; 7; 8; 8; 7.

Page 13

Aim: To reteach the relationship which exists between subtraction and addition

Suggestions: Ex. 1–10 on this page reteach pupils the inverse relationship which exists between subtraction and addition. Pupils are instructed how to recall subtraction facts by considering the correlative addition fact. Ex. 3 illustrates this well. Beginning with ex. 11, pupils are provided with more practice on the basic subtraction facts.

Key: **4.** 6. **5.** 4. **6.** 8. **7.** 9. **8.** 7. **9.** 7. **10.** 7. **11.** 5; 3; 9; 8; 8. **12.** 3; 4; 8; 5; 9. **13.** 6; 2; 4; 8; 9. **14.** 2; 4; 5; 5; 9. **15.** 0; 2; 7; 9; 2.

Page 14

Aim: To reteach the subtraction of 3-figure and 4-figure numbers where regrouping is involved

Suggestions: The illustrative example is a most difficult one and describes a triple regrouping situation. Some teachers prefer to precede the work of this page with simpler examples. For instance, they begin with examples involving no regrouping

$$\begin{array}{r}4538\\ \underline{2117}\end{array}$$

and proceed to one-step regrouping

$$\begin{array}{r}5942\\ \underline{3825}\end{array}$$

and continue with two-step regrouping

$$\begin{array}{r}3835\\ \underline{1489}\end{array}$$

In each case, pupils should be encouraged to talk out the example and explain what they are doing.

Key: **2.** 165; 2763. **3.** 16; 2893. **4.** 253; 4745. **5.** 255; 1988. **6.** 384; 1399. **7.** 276; 441; 66; 179; 610; 4044; 507. **8.** 189; 89; 509; 142; 97; 2835; 1236. **9.** 324; 795; 266; 165; 523; 3978; 2877.

Page 15

Aim: To review eight thought patterns in subtraction

Suggestions: All the thought patterns listed in ex. 1 were taught in previous grades. The problems which follow use some of these thought patterns. Pupils will enjoy making up problems using these thought patterns.

Key: **2.** (c); 50¢ − 12¢ = 38¢. **3.** (f); 83 − 75 = 8 (tickets). **4.** (d); $5.00 − $3.38 = $1.62. **5.** (g); $9.25 − $7.89 = $1.36. **6.** (a); 500 − 325 = 175 (chickens). **7.** (b); 39¢ − 25¢ = 14¢.

Page 16

Aim: To review addition and subtraction examples

Suggestions: Pages 8, 13, and 14 reteach process work in addition and subtraction. This page provides a quick way for the teacher to test the class. Use the folded-paper method for ex. 4, 5, 9, 10, and 11.

Key: **1.** $3.45 + $4.08 + $.95 + $1.17 = $9.65. **2.** $10.00 − $9.65 = $.35; 1 dime and 1 quarter. **3.** $9.65 − $7.98 = $1.67 (less). **4.** 241; 200; 2272; 2074; 1830; 20,000; 18,131. **5.** 195; 225; 1895; 1627; 1420; 20,265; 7173. **6.** $200.00. **7.** $6.64. **8.** $5.55. **9.** 39; 68; 93; 242; 67; 179; 1547. **10.** 18; 26; 129; 121; 479; 2485; 3859. **11.** 26; 6; 64; 8; 249; 1139; 1882.

Page 17

Aim: To present problems dealing with a school picnic

Suggestions: The problems on this page review basic addition, subtraction, multiplication, and division thought patterns. Be sure that pupils:

1. Estimate the answer before solving the problem.
2. Label all answers (*i.e.*, children, people, hours, and so on).

Key: **1.** $255 - 9 = 246$ (children). **2.** $246 + 6 + 8 = 260$ (people). **3.** $208 + 40 = 248$ (people who rode in busses and cars); $260 - 248 = 12$ (people who rode bicycles). **4.** (This problem is perhaps best suited to superior pupils.) From 9:30 A.M. to 12:00 noon, there are 2 hr. 30 min. From 12:00 noon to 6:45 P.M., there are 6 hr. 45 min. 2 hr. 30 min. + 6 hr. 45 min. = 8 hr. 75 min., or 9 hr. 15 min. **5.** $260 + 260 = 520$ (hot dogs). Yes, since 540 is more than 520. **6.** (1) 2 doz. = 24; $540 + 24 = 564$ (rolls); (2) 12 rolls.

Page 18

Aim: To provide a quick test in addition and subtraction

Suggestions: This page is entitled "Testing Yourself" and is just that. Some teachers extend this activity to include the idea of "Marking Yourself" and provide the pupils with the answers to the examples. The pupil takes the test, corrects his paper, and does not show it to the teacher. He then sets about building a remedial program for himself and asks the teacher for extra help in certain types of examples.

Key: **1.** 869; 468; 1014; 561; 3805; 7237. **2.** 1892; 1659; 1361; 1000; 11,297; 14,484. **3.** 566; 159; 144; 257; 917; 4864. **4.** \$62.54. **5.** 86; 135. **6.** 689. **7.** \$21.00. **8.** 2908. **9.** $\$.15 + \$.15 + \$.07 + \$.03 + \$.05 = \$.45$. **10.** $\$1.00 - \$.45 = \$.55$.

Page 19

Aims: To test the pupils' mastery of the 100 multiplication facts and to reteach the commutative principle

Suggestions: The test on the 100 addition facts, given on page 5 of the text, can be used also as a test on the 100 multiplication facts. The only difference is that in one case the numbers are added while in the other case they are multiplied. This test should be an oral test, as suggested on page 327 of the text.

If the test on the multiplication facts shows that certain pupils have not mastered all the facts, remedial work will be necessary. Ex. 2–5 on this page give suggestions on such work. Ex. 3 explains the commutative principle. Further suggestions on remedial work are given on pages 20–23 of the text.

Key: **1.** 1. 35; 10; 54; 32; 0; 15; 40; 4; 45; 18. 2. 8; 12; 0; 27; 35; 30; 0; 56; 21; 2. 3. 1; 45; 64; 20; 0; 4; 16; 0; 2; 0. 4. 72; 28; 0; 12; 48; 0; 9; 3; 28; 0. 5. 15; 24; 63; 32; 8; 40; 0; 36; 0; 36. 6. 20; 54; 9; 0; 56; 6; 0; 24; 9; 6. 7. 24; 5; 42; 0; 12; 81; 24; 0; 3; 72. 8. 14; 0; 18; 5; 12; 42; 6; 0; 8; 18. 9. 16; 6; 30; 36; 7; 10; 0; 21; 14; 25. 10. 48; 49; 8; 7; 16; 18; 0; 63; 4; 27. **4.** 54; 63; 40; 24; 24; 45. **5.** No matter how many times you add zero, your sum is zero. **6.** By adding 6×8 and 8; by adding 4×8 and 8.

Pages 20–21

Aim: To teach the pupils how to remember the 9's facts in multiplication

Suggestions: These pages will merit most careful study since they describe a very interesting way by which the pupil can get the answer to a 9's multiplication fact if he has forgotten it. The plan depends upon certain interesting number relationships connected with the 9's facts in multiplication. These relationships are as follows:

(1) In the 9's facts the sum of the two figures in each answer is always 9. For example, the answer to 5 × 9 is 45; if you add 4 and 5, the sum is 9. Likewise, the answer to 8 × 9 is 72; if you add 7 and 2, the sum is 9.

(2) If you know the first figure of the answer to a 9's fact, you can get the second figure by adding enough to the first figure to make 9. For example, if the first figure of the answer is 3, the second figure must be 6 because 3 and 6 make 9. If the first figure is 7, the second must be 2 because 7 and 2 make 9.

(3) In the 9's facts the first figure of the answer is always 1 *less* than the number by which 9 is multiplied. For example, in 7 × 9 = 63, the first figure of 63, which is 6, is 1 less than 7. Likewise, in 6 × 9 = 54, the first figure of 54, which is 5, is 1 less than 6.

Ex. 1 on page 20 explains to the pupil the first of the relationships given above, while ex. 2 and 3 explain the second of these relationships. Ex. 4–6 on page 21 explain the third relationship. Ex. 7–10 show the pupil how to use the three relationships to find the answer to any of the 9's facts. After a little practice, the pupil can quickly get the answer to any of the 9's facts by this method.

It should be understood that the purpose of this work is to show the pupil how to obtain the answer to a 9's fact if he has forgotten it and to do this by a *process of thinking* instead of asking the teacher the answer or looking it up in a chart or a table. By obtaining the correct answer several times through the three relationships, he will soon memorize it. If the pupil already knows the 9's facts, the work on pages 20 and 21 is, of course, unnecessary. The 9's facts have always been regarded as among the most difficult of the multiplication facts; hence, it is probable that a number of pupils still have trouble with some of these facts and, consequently, will profit by this interesting work.

Key: **1.** Yes. **2.** 4. **3.** 1; 5; 6; 3. **6.** Yes; 7; 3; 4; 8; 6. **9.** 54; 45; 27; 63; 36. **10.** 63; 45; 27; 54; 72; 36.

Pages 22–23

Aim: To teach the pupils how to remember the multiplication facts for the 4's, 6's, and 8's

Suggestions: Most pupils have little difficulty with the multiplication facts for the 2's and the 3's, but trouble sometimes develops with the 4's. Page 22 shows how the pupil's knowledge of the 2's facts will help him to obtain the answer to any of the 4's facts if he has forgotten it. Similarly, ex. 1–6 on page 23 show the pupil how to use his knowledge of the 3's facts to obtain the answer to any one of the 6's facts. Ex. 7–9 show the pupil how to use his knowledge of the 4's facts to obtain any one of the 8's facts. It should be stated that the work on pages 22 and 23, by which the pupil gets a hard fact from an easy fact, is all *mental work.* This mental work is easily done, however, after very little practice. The sole purpose of all the work on pages 22 and 23 is to present methods by which the pupil can find the answer to a forgotten fact *by means of a process of thinking* instead of by looking it up or asking the teacher to tell it to him. After the pupil finds the correct answer a few times in this way, he soon comes to remember it so that he can say it instantly without help of any kind. The work on pages 22 and 23 is, of course, another application of number relationships.

Key: Page 22 **6.** 28; 24; 32; 20; 36; 30; 42; 48. **7.** 20; 28; 16; 24; 36. **8.** 32; 36; 24; 28; 32.

Page 23 **4.** 48; 54; 56; 64; 72; 42; 40; 36. **5.** 24; 48; 54; 42; 30. **6.** 54; 30; 42; 36; 48. **8.** 40; 64; 56; 48; 72. **9.** 72; 56; 32; 40; 48.

Page 24

Aim: To reteach multiplication by 1-figure numbers

Suggestions: Use the folded-paper method for ex. 3–7. Encourage pupils to make rough estimates for each answer *before beginning the computation.* Stress rounding off to the nearest ten, hundred, thousand, and so on. For instance, in ex. 3 —

$$\begin{array}{r} 78 \\ \underline{5} \end{array} \text{— is roughly } 5 \times 80 \text{ or } 400$$

$$\begin{array}{r} 35 \\ \underline{8} \end{array} \text{— is roughly } 8 \times 40 \text{ or } 320$$

$$\begin{array}{r} 234 \\ \underline{2} \end{array} \text{— is roughly } 2 \times 200 \text{ or } 400$$

Workbook Reference: Arithmetic Workshop, Book 5, page 6

Key: **3.** 390; 280; 720; 468; 5400; 7720; $241.14. **4.** 180; 322; 318; 1045; 7864; 3516; $228.33. **5.** 192; 432; 245; 4936; 2695; 9642; $83.00. **6.** 203; 192; 111; 1332; 820; 19,840; $215.16. **7.** 846; 420; 232; 2772; 5160; 8421; $461.86.

Page 25

Aim: To reteach that multiplication is a short way of making equal additions

Suggestions: The problems on this page are planned to strengthen the pupils' understanding of the relationships which exist between addition and multiplication. Whereas problem 1 can be completed easily by either addition or multiplication, problem 2 can be completed only by addition. Stop at this point and contrast the two situations. Encourage the pupils to use multiplication in problem 1. Do the same for problems 3 and 4.

Key: **1.** 2 × 216 = 432 (oranges). **2.** 30 + 36 + 32 = 98 (cookies). **3.** 4 × 96 = 384 (tickets). **4.** 3 × $.75 = $2.25. **5.** 6 × 25¢ = 150¢, or $1.50.

Page 26

Aim: To show how to enjoy magic squares

Suggestions: The history of magic squares is mentioned in the Teacher's Guide for *American Arithmetic, Grade 4*. If the pupils have used the Grade 4 text, they have already experienced the fun connected with this activity. Ex. 1 on this page shows the pupil how to test a magic square. For a square to be a magic square, each row, each column, and each diagonal must add up to the same total. In other words, ten totals must be the same. Ex. 5–7 require the pupil to determine the missing numbers in each square so that it will become a *magic* square. Help the pupil by suggesting that he find out what the *magic* total is for a given square and then "compute backwards" from that point to ascertain the missing number. The more able pupils will try to make up magic squares for themselves by starting with blank spaces. Such a combination is an extremely difficult one to make, and any pupil who completes such an activity will be thrilled at his good fortune and persistent calculation.

Workbook Reference: Arithmetic Workshop, Book 5, page 52

Key: **2.** Yes; all 10 sums are 34. **3.** Yes; all 10 sums are 34. **4.** Yes; all 10 sums are 144.

13	8	15	2
7	10	5	16
4	17	6	11
14	3	12	9

5. Total: 38

12	14	19	5
15	9	8	18
6	20	13	11
17	7	10	16

6. Total: 50

40	26	16	18
14	20	38	28
34	32	10	24
12	22	36	30

7. Total: 100

Page 27

Aim: To reteach measures of length — inch, foot, yard, and mile

Suggestions: There are two major teaching objectives in the study of measures. These are:

1. To acquire a facility at approximating measures
2. To know which measure to use in a given instance

The second of these objectives is developed by exercises similar to ex. 4, 5, and 6. The first objective, however, is best developed by informal discussions between teacher and class. Such questions as these may be used:

1. About how long is our school building?
2. About how far is it from our town to —?

3. How far from the school do you live?
4. How tall is the flagpole in the schoolyard?

Key: **4.** inches; feet. **5.** miles; inches. **6.** yards; inches. **7.** 36; 50. **8.** 4; 112. **9.** 45; 16.

Page 28

Aim: To review multiplication thought patterns

Suggestion: The central theme of a school fair is chosen for this review work. Some schools hold a fall fair, and these problems would correlate well with such an activity.

Workbook Reference: Arithmetic Workshop, Book 5, page 7

Key: **2.** 64 × 8¢ = 512¢, or $5.12. **3.** 120 × 7¢ = 840¢, or $8.40. **4.** 175 × 5¢ = 875¢, or $8.75. **5.** 144 × 3¢ = 432¢, or $4.32. **6.** 100 × 5¢ = 500¢, or $5.00. **7.** 125 × 8¢ = 1000¢, or $10.00. **8.** 132 × 3¢ = 396¢, or $3.96. **9.** 50 × 6¢ = 300¢, or $3.00. **10.** 72 × 4¢ = 288¢, or $2.88. **11.** 25 × 9¢ = 225¢, or $2.25.

Page 29

Aim: To review addition, subtraction, and multiplication examples which are stated horizontally, and special arithmetic words

Suggestions: The work on this page is divided into two entirely different activities. Many teachers prefer to begin with ex. 13 and check vocabulary mastery first. The remaining time may then be devoted to rapid calculation, in which the slower pupil will not accomplish so much as the fast student.

Key: **1.** 3043; 8958; 184. **2.** 1499; 35,865; 200. **3.** 768; 24,936; 221. **4.** 658; 2854; 213. **5.** 5536; 41,296; 207. **6.** 3572; 11,570; 200. **7.** 1625; 34,349; 221. **8.** 2764; 26,763; 198. **9.** 514; 15,534; 250. **10.** 2745; 25,035; 249. **11.** 148; 17,190; 163. **12.** 1688; 24,592; 194. **13.** Product. **14.** Addend. **15.** Remainder. **16.** Difference. **17.** Multiplicand. **18.** Subtrahend. **19.** Sum. **20.** Minuend. **21.** Multiplier.

Page 30

Aim: To reteach measures of weight — ounce, pound, ton

Suggestion: See the instructions for page 27 in this Guide, and stress the skill of estimating.

Key: **4.** 6000; 64; 1, 4. **5.** 10,000; 32; 1, 9. **6.** 1000; 8; 1, 3. **7.** (1) More than a $\frac{1}{2}$ lb.; (2) $\frac{1}{2}$ lb. = 8 oz.; 11 oz. – 8 oz. = 3 oz. (more than a $\frac{1}{2}$ lb.). **8.** Less than a pound; a pound = 16 oz.

Page 31

Aim: To test the 90 even division facts

Suggestions: Refer to instructions for teaching page 5 of *American Arithmetic, Grade 5.* Since much of the work of this grade will be in division, pupils must demonstrate an ability to recognize these even division facts quickly and accurately. Flash cards should be constructed for pupils who need special help in this work.

Key: **1.** 3; 1; 7; 7; 4; 2. **2.** 5; 0; 7; 2; 3; 0. **3.** 1; 7; 5; 3; 9; 9. **4.** 0; 3; 6; 8; 5; 7. **5.** 4; 1; 8; 8; 9; 5. **6.** 4; 0; 7; 4; 9; 4. **7.** 2; 1; 5; 6; 4; 9. **8.** 0; 2; 3; 4; 6; 7. **9.** 0; 1; 2; 6; 6; 5. **10.** 0; 9; 2; 5; 7; 3. **11.** 2; 1; 3; 8; 2; 9. **12.** 1; 3; 5; 9; 6; 8. **13.** 0; 1; 5; 8; 9; 8. **14.** 8; 0; 2; 7; 3; 6. **15.** 1; 6; 6; 4; 8; 4.

Page 32

Aim: To reteach the relationship which exists between division and multiplication

Suggestions: *American Arithmetic, Grade 4* continually stressed the relationship which exists between division and multiplication. In fact, all division facts were taught in their relationship to correlative multiplication facts. The work of this page refreshes the memory of the pupil in this work, and ex. 4–13 are only samples of the work which the modern teacher will plan at this time for her class. Pupils must be led to the realization that a knowledge of the basic multiplication facts unlocks the door not only to success in multiplication but also to success in division.

Key: **4.** 5; 5. **5.** 5; 5. **6.** 9; 9. **7.** 9; 9. **8.** 4; 4. **9.** 6; 6. **10.** 8; 8. **11.** 7; 7. **12.** 8; 8. **13.** 9; 9.

Page 33

Aim: To reteach division by 1-figure numbers when there are no remainders

Suggestions: These examples require no knowledge of the uneven division facts. The arithmetic words *divisor*, *dividend*, and *quotient* should be used by the pupils. Ending and middle zeros appear in dividends, and place value should be fully discussed. Checking by means of multiplication is explained in the illustrative example.

Workbook Reference: Arithmetic Workshop, Book 5, page 12

Key: **2.** 22; 32; 13; 50; 81; 51. **3.** 10; 32; 12; 80; 80; 21. **4.** 43; 11; 12; 91; 201; 93. **5.** 20; 10; 10; 83; 81; 30. **6.** 22; 11; 14; 101; 70; 70.

Page 34

Aim: To introduce factors and to reteach basic uneven division facts

Suggestions: The multiplier and multiplicand are called *factors* of a product. Finding the missing factor lays a foundation for understanding the multiplication — division relationship, i.e., division is the inverse operation of multiplication. Division facts like $3\overline{)6}$ and $4\overline{)12}$ are called *even division facts* since the division is exact without a remainder. Facts like $3\overline{)7}$ and $4\overline{)14}$ are called *uneven division facts* because the division is not exact and leaves a remainder. In both the even and the uneven division facts, the quotient is always a number of 1 figure. An example like $2\overline{)23}$ is *not* an uneven division fact because the quotient is a 2-figure number.

There are about four times as many uneven division facts as there are even division facts, and thus the examples on this page are only suggestive of the reteaching program which some pupils may require before they are able to proceed satisfactorily to long division. Use flash cards, number wheels, games, and so on to provide adequate and varied practice on these facts.

Workbook Reference: Arithmetic Workshop, Book 5, page 13

Key: **3.** 7; 9; 6. **4.** 12; 11; 21. **5.** 43; 41; 21. **7.** 6 R1; 7 R1; 2 R4; 2 R3; 9 R1; 3 R4; 1 R6. **8.** 5 R7; 6 R6; 4 R2; 4 R4; 8 R4; 2 R3; 6 R4. **9.** 9 R2; 8 R2; 7 R3; 6 R2; 6 R2; 8 R1; 7 R1.

Page 35

Aim: To reteach division by 1-figure numbers with uneven division facts in the dividend

Suggestion: Pupils who perform poorly on these examples are not certain of the uneven division facts and need more practice as described in the Guide for the preceding page.

Workbook Reference: Arithmetic Workshop, Book 5, page 15

Key: **3.** 14; 18; 86 R5; 96; 68; 59. **4.** 18; 20 R2; 57; 81 R7; 67 R2; 75. **5.** 29 R1; 14 R1; 49; 14; 37; 57 R1. **6.** 47 R1; 15 R2; 56 R1; 49; 90 R5; 83 R1. **7.** 13; 10 R5; 27; 38; 36 R2; 92 R2.

Page 36

Aim: To provide an oral review

Suggestions: *American Arithmetic, Grade 3* and *Grade 4* provide many opportunities in mental arithmetic. Pupils in Grade 5 should be encouraged to develop this skill more fully. Many teachers expand the activities suggested in the textbook. For instance, ex. 1, 2, 5, 6, 7, 12, and 13 on this page can easily be expanded by writing additional numbers on the blackboard.

Key: **1.** 6, 9, 3, 7, 5, 8, 2 R1, 3 R2. **2.** 2, 7, 5, 3, 9, 6, 4, 1 R1. **4.** 9998, 9999, 10,000, 10,001, 10,002. **5.** 36, 63, 91, 25, 42, 77, 54, 70; 34, 61, 89, 23, 40, 75, 52, 68; 37, 64, 92, 26, 43, 78, 55, 71; 35, 62, 90, 24, 41, 76, 53, 69. **6.** 16, 34, 4, 46, 58, 28, 52, 22, 40. **7.** 77, 41, 86, 14, 59, 32, 68, 5, 50. **8.** 40¢ + 10¢ + 2¢ = 52¢. **9.** 50¢ + 10¢ + 15¢ + 4¢ = 79¢. **10.** 25¢ + 30¢ + 10¢ + 9¢ = 74¢. **12.** 84, 42, 13, 30, 81, 45, 89, 68; 79, 37, 8, 25, 76, 40, 84, 63. **13.** 53, 54, 55, 65, 75, $1.00; 20, 25, 50, $1.00; 40, 50, $1.00; 42, 43, 44, 45, 50, $1.00; 79, 80, 90, $1.00; 40, 50, $1.00; 64, 65, 75, $1.00. **14.** 15 min.; 46 min. **15.** 25 min.; 28 min. **16.** 25 min.; 35 min. **17.** 27 min.; 52 min. **18.** 43 min.; 45 min.

Page 37

Aim: To reteach the division of 4-figure numbers by 1-figure divisors and extend to dollars and cents

Key: **2.** 873; 169; 488; 516; $9.15 R2¢. **3.** 237 R5; 419; 248; 415; $1.32. **4.** 732; 968 R1; 806; 625; $5.28. **5.** 697; 376; 756; 314; $8.25. **6.** 740 R2; 290 R5; 409 R3; 916; $7.83 R1¢.

Pages 38–39

Aim: To reteach six thought patterns in division

Suggestion: All these thought patterns were first taught in *American Arithmetic, Grade 4* and are illustrative of hundreds of problems in division. An understanding of these thought patterns — rather than a memorization of them — is the desired learning outcome of these pages.

Key: **1.** $120 \div 8 = 15$ (sets). **2.** $144 \div 6 = 24$ (packages). **3.** $25¢ \div 6¢ = 4$ (candy bars), R1¢. **4.** $84¢ \div 3¢ = 28$ (stamps). **5.** $45 \div 5 = 9$ (chairs). **6.** $72 \div 3 = 24$ (cookies). **7.** $\$5.00 \div 2 = \$2.50$. **8.** $21 \div 3 = 7$ (fish). **9.** $\$2.85 \div 3 = \$.95$. **10.** $42¢ \div 6 = 7¢$.

Page 40

Aim: To review 1-figure multiplication and division

Key: **1.** $5 \times \$.90 = \$4.50$. **2.** $\$4.50 \div 2 = \$2.25$. **3.** $\$2.25 - \$.75 = \$1.50$. **4.** $2 \times \$2.75 = \$5.50$. **5.** 348; 2367; 1857; 2030; 10,381; \$37.50; \$98.96. **6.** 294; 1350; 1935; 4512; 12,424; \$80.55; \$179.69. **7.** 96 R1; 59 R3; 297 R4; 659; \$4.53. **8.** 84; 38 R2; 548; 406; \$9.87. **9.** 69 R5; 80 R1; 372; 647; \$3.75 R5¢. **10.** 16,772. **11.** 465. **12.** \$2.75.

Page 41

Aim: To provide a self-test

Suggestion: The first self-test was encountered on page 18. The Teacher's Guide suggested that this work could be extended to "Marking Yourself" and thus prepare for the chapter tests to follow.

Key: **1.** 825; 3430; 7664; 3090; 27,225; 7764. **2.** 873; 409 R4; 629; 715 R3; 850 R8. **4.** 750. **5.** Dividend; divisor. **6.** 42,240. **7.** 457 R1. **8.** $576 \times 4¢ = 2304¢$, or \$23.04. **9.** 437. **10.** $\$127.20 \div 6 = \$21.20$. **11.** $6 \times \$2.95 = \$17.70$

Page 42

Aim: To review the major aims of Chapter 1

Suggestion: This page reviews eight of the ten major aims listed in the Teacher's Guide at the beginning of Chapter 1. These are:

Chapter Review	*Aim Number*
Ex. 1 and 2	2
Ex. 3 and 4	4
Ex. 5–7	3 and 4
Ex. 8–10	5
Ex. 11	6
Ex. 12 and 13	7 and 1
Ex. 14 and 15	8 and 1

Key: **1.** 29; 43; 25; 81; 50. **2.** 70; 98; 63; 54; 82. **3.** 31; 50; 85; 23; 63. **4.** 44; 76; 25; 43; 34. **5.** 2091; 2954; 8212. **6.** 1463; 278; 5000. **7.** 2000; 4155; 2475. **8.** 48; 2; 18. **9.** 10,560; 288; 32. **10.** 108; 10,000; 6000. **11.** \$3.81. **12.** 1188;

3204; 1424; 1134; 7172; 16,182; 27,657. **13.** 4272; 2025; 4254; 2432; 14,028; 14,365; 21,576. **14.** 735 R5; 247 R3; 467; 327 R2; 989. **15.** 324; 805; 286 R6; 380 R3; 519. **16.** 597; 906; 795; 896 R2; 694.

Page 43

Aim: To give Problem Test 1

Suggestions: Allow pupils ample time to read and complete these problems. After you have scored the problems, provide an opportunity for the pupils to make a chart of problem-test scores. As successive tests are taken, remind the pupils to add their ratings to it. As the year unfolds, each pupil will thus have a way of comparing his test scores. These ratings are not meant as class ratings, but are placed here to increase pupil initiative and to aid in self-rating.

Key: **1.** 15¢ + 6¢ + 7¢ + 75¢ + 29¢ = 132¢, or $1.32. **2.** 283 × 5¢ = 1415¢, or $14.15. **3.** 1 lb. = 16 oz.; 22 oz. − 16 oz. = 6 oz. (more than a pound). **4.** $20.60 − $18.45 = $2.15. **5.** Yes. **6.** $3.56 ÷ 4 = $.89. **7.** 3 × $19.95 = $59.85. **8.** $18.50 − $15.59 = $2.91. **9.** 132 ÷ 8 = 16 R4, or 16 bags, 4 pieces. **10.** 386 + 425 + 512 = 1323 (children).

Page 44

Aim: To provide a diagnostic test with practice-page references

Suggestions: The exercises on this page are carefully graded, and each one contains a certain type of example. Pupils who miss more than one example in an exercise are urged to turn to the practice page and complete additional examples. Many teachers treat this work as a self-assignment and encourage the pupil to make his own analysis and assignment.

Key: **1.** 213; 1849; 1901; 8593; 6375. **2.** 237; 265; 27; 1865; 490. **3.** 414; 207; 235; 3646; 729. **4.** 624; 2838; 3400; 11,925; $75.81. **5.** 388; 5832; 1148; 16,520; $217.47. **6.** 9 R3; 4 R2; 4 R5; 3 R4. **7.** 6 R4; 7 R3; 9 R5; 8 R3. **8.** 73; 201; 81; 90. **9.** 49; 57 R1; 63 R3; 45. **10.** 504; 795; $2.75; $3.18 R2¢.

Chapter 2

Aims of Chapter 2. The major aims of Chapter 2 are to:

1. Review the skills of Chapter 1.
2. Reteach multiplication by 10.
3. Teach multiplication by 100.
4. Reteach liquid measure.
5. Reteach finding of averages and introduce the word *per.*
6. Reteach multiplication by 2-figure and 3-figure numbers.
7. Reteach the fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$.
8. Reteach the words *quarter* and *fraction.*
9. Teach the calculation of $\frac{2}{3}$, $\frac{3}{4}$, and so on of groups of things.
10. Reteach two-step problems and problems without numbers.
11. Teach how to solve word problems which contain extra facts.
12. Teach the skill of taking a timed test.

Pages 45–46

Aim: To present word problems dealing with Yellowstone Park

Suggestions: Yellowstone Park is one of our most magnificent national parks. It is located at a high elevation and contains beautiful lakes, glaciers, mountains, hot springs, and natural wonders. Many persons visit Yellowstone Park each year, and there is a good chance that one of your pupils has either visited the Park or has a relative who has visited it. Begin the lesson by asking whether pupils have pictures or other things that they can bring to class to show some of the wonders of this national park. Place the pictures on the bulletin board and encourage the pupils to talk about them and to ask questions. Other pupils might collect information from encyclopedias and other sources. Thus the motivation for solving the problems on these pages is developed. The facts found in these problems are authentic. Any of the pupils who enjoy fishing will be interested in the beautiful trout found in Yellowstone Lake and the fact that fishermen rush there for the opening day of the fishing season.

Key: Page 45 **1.** 1378 mi. + 1378 mi. = 2756 mi. **2.** 1872 − 1807 = 65 (yr.). **3.** 1 mi. = 5280 ft.; 7731 ft. − 5280 ft. = 2451 ft. **4.** 100 ÷ 4 = 25 (hr.).
Page 46 **1.** 308 ft. − 112 ft. = 196 ft. **2.** 900 ÷ 300 = 3 (times). **3.** Round. **5.** 11 wk. 6 da.

Page 47

Aim: To reteach multiplication by 2-figure numbers

Suggestions: The illustrative examples show the long and short ways of doing this work. Be sure that the pupils thoroughly understand why it is possible to set over the partial product of the tens multiplier before allowing them to use the short cut (Method B). If some pupils are more secure in using Method A, allow them to do so. Ex. 3–5 may be completed by the folded-paper method.

Workbook Reference: Arithmetic Workshop, Book 5, pages 6 and 10

Key: **3.** 1976; 5070; 1702; 12,366; 19,404; 10,621; 70,288. **4.** 2325; 3136; 7268; 19,908; 13,842; 24,892; 8856. **5.** 9114; 2646; 2880; 13,300; 9558; 13,396; 24,302.

Page 48

Aim: To extend the reteaching of multiplication by 2-figure numbers to dollars and cents

Suggestion: Pupils should realize that when they are multiplying dollars and cents by a number, the answer must also be in dollars and cents.

Key: **1.** 43 × $1.35 = $58.05. **2.** 54 × $4.95 = $267.30. **3.** 18 × 36 = 648 (packages of seeds). **4.** 86 × $.75 = $64.50. **5.** 4368; 456; 3337; 6860; 42,054; $79.92; $102.08. **6.** 6474; 1400; 988; 4370; 43,483; $118.80; $71.76. **7.** 2436; 3082; 8736; 1225; 21,918; $252.32; $406.38. **8.** 1357; 5394; 6000; 4899; 26,818; $559.70; $106.95. **9.** 2346; 1767. **10.** 7245.

Page 49

Aim: To review addition and subtraction skills

Suggestions: Ex. 1–2 provide more practice in adding by endings and should be completed orally. Many teachers will extend the work of these two exercises by suggesting that "7 be added to each number, 4 added to each number," and so on. Ex. 3–4 deal with mental subtraction, which will be needed when division is taught. The remaining exercises should be completed with pencil and paper.

Key: **1.** 35, 94, 102, 81, 87, 73, 105, 67; 36, 95, 103, 82, 88, 74, 106, 68. **2.** 61, 33, 26, 90, 56, 42, 69, 54; 62, 34, 27, 91, 57, 43, 70, 55. **3.** 40, 82, 23, 31, 64, 80, 44, 61; 36, 78, 19, 27, 60, 76, 40, 57. **4.** 25, 68, 36, 84, 17, 49, 56, 88; 21, 64, 32, 80, 13, 45, 52, 84. **5.** 8701; 4068; 10,645; 6121; 11,001. **6.** 1715; 872; 1367; 2149; 1003. **7.** $18.75 + $4.95 = $23.70. **8.** $24.25 − $19.95 = $4.30. **9.** 256; 248; 268; 284; 304; 292; 305; 320. **10.** 9510; 14,267. **11.** 19,879; 11,665. **12.** 4707; 19,963. **13.** 624; 756. **14.** 68; 488.

Page 50

Aim: To provide more practice in multiplying by 2-figure numbers

Key: **2.** 304,330; 241,178; 533,352; 36,864; $879.24; $802.62. **3.** 77,220; 267,150; 147,026; 124,375; $921.25; $943.25. **4.** 315,672; 79,230; 62,010; 171,819; $3227.10; $7440.95. **5.** 49,256; 131,412; 180,480; 263,529. **6.** 124,110; 403,956; 194,733; 268,254. **7.** 125,164; 223,242; 82,621; 50,315. **8.** 260,440; 108,375; 723,945; 279,990.

Page 51

Aim: To reteach the multiplication of numbers by 10 and extend this short cut to multiplying by 100

Suggestions: The work discussed in ex. 1 and 2 was carefully taught in *American Arithmetic, Grade 4* and preceded the work in multiplying by 2-figure numbers.

It was emphasized that any multiplication by even tens was no different from multiplying by a ones number except that the product began in the tens place. A zero was annexed to keep the number over in the tens place. This work is a practical application of the understanding that zero is a place holder. In like manner, multiplication by 100 is no different from multiplying by a ones number except that the product must begin in the hundreds place. Therefore, this product must be pushed over by two zeros so that it appears in the hundreds place. The offset method is illustrated in ex. 5 and is a commonly used short cut. However, the examples in ex. 6–8 may be completed *mentally* by some pupils and would not have to be rearranged in vertical form. For instance:

> 80 × 26 "8 × 6 = 48. Write 8 and carry 4 mentally. 8 × 2 = 16; 16 + 4 = 20. Write 20 in front of 8 and annex a zero after the 8, since you are multiplying by 8 tens. The answer is 2080."

Key: 1. 50; 90; 150; 230. **2.** 400; 700; 300; 500; 900; 1700; 2500. **3.** 480; 300; 660; 630; 320; 600. **4.** 7700; 8400. **6.** 2080; 840; 14,800; 22,400. **7.** 570; 2300; 45,500; 17,400. **8.** 600; 1940; 64,000; 24,000.

Pages 52–53

Aim: To reteach the solving of two-step problems

Suggestions: Two-step problems were first presented in *American Arithmetic, Grade 4.* The explanation in problem 1 fully discusses the thought patterns required for the solution of these problems. Urge the pupils to estimate the answer before solving the problem. Also remind the pupils to label their answers *pounds, cents, dollars,* and so on.

Workbook Reference: Arithmetic Workshop, Book 5, page 9

Key: 2. How much did Sally's lunch cost? 15¢ + 7¢ + 5¢ + 4¢ = 31¢; 50¢ − 31¢ = 19¢. **3.** How much did the cloth cost? 4 × $1.69 = $6.76; $6.76 + $.89 = $7.65. **4.** How many cookies are 16 doz. cookies? 12 × 16 = 192 (cookies); 200 − 192 = 8 (cookies). **5.** How much did Jack collect for the eggs? 3 × $.68 = $2.04; $2.04 − $.45 = $1.59. **6.** How many oranges are 18 doz. oranges? 12 × 18 = 216 (oranges); 216 × 5¢ = 1080¢, or $10.80. **7.** What was the cost of the picnic? $.22 + $.25 + $.59 + $.42 + $.26 = $1.74; $1.74 ÷ 6 = $.29. **8.** How many people were at the play? 12 × 15 = 180 (people); 180 × $.35 = $63.00. **9.** How much did each boy earn? $3.00 ÷ 2 = $1.50; $1.50 − $.89 = $.61. **10.** How much did Ann have after she earned $2.50? $3.85 + $2.50 = $6.35; $6.35 − $5.00 = $1.35. **11.** What is the cost of 12 post cards at 5¢ each? 12 × 5¢ = 60¢, or $.60; $.60 − $.49 = $.11. **12.** How much does 1 gal. of gasoline cost? $2.34 ÷ 9 = $.26; 15 × $.26 = $3.90. **13.** How much did Betty spend? $.19 + $.32 + $.25 + $.07 = $.83; $1.00 − $.83 = $.17. **14.** How much does Bill earn all together in 1 wk.? $1.75 + $1.50 = $3.25; 14 × $3.25 = $45.50. **15.** How many cookies are 10 doz. cookies? 10 × 12 = 120 (cookies); 120 × 4¢ = 480¢, or $4.80. **16.** How many stamps did Bill get from those he bought with Jim? 150 ÷ 2 = 75 (stamps); 212 + 75 = 287 (stamps).

Page 54

Aim: To reteach liquid measures — cup, pint, quart, and gallon

Suggestions: One of the basic learnings on this page is the art of estimating measures. Pupils should be allowed to approximate the amount of cups, pints, and so on in a given quantity of liquid. Additional exercises similar to ex. 6 will help the pupil develop a meaningful approach to this work.

Key: **3.** 2; 4; 4. **4.** 2; 8. **5.** 4; 16. **7.** 8 qt. = 2 gal.; 2 × $1.75 = $3.50. **8.** 2; 8; 3. **9.** 1; 32; 18. **10.** 8; 12; 12. **11.** 12; 16; 2. **12.** 8; 4; 2.

Page 55

Aim: To present problems dealing with liquid measures

Suggestions: Almost every child of this age aspires to own a lemonade stand. The problem situations described here are true to life and easily understood. Some pupils may be encouraged to relate problems of their own which came from a similar sales experience during the past summer.

Key: **1.** 6 × $.45 = $2.70; $2.70 + $.22 + $1.00 = $3.92. **2.** (1) 1 doz. = 12 (lemons); 3 × 12 = 36 (cups of lemonade); (2) 6 doz. = 72 (lemons); 3 × 72 = 216 (cups of lemonade). **3.** (1) 216 − 9 = 207 (cups of lemonade); (2) 207 × 6¢ = 1242¢, or $12.42. **4.** $12.42 − $3.92 = $8.50. **5.** $8.50 − $.25 = $8.25; $8.25 ÷ 3 = $2.75.

Page 56

Aim: To review fundamental skills

Suggestions: Encourage pupils to circle on their papers any examples that were not clear or easy to do. Observe the work habits of the various pupils and determine what type of problem is difficult for a particular child.

Key: **1.** 24; 17; 24; 32; 289; 346. **2.** 45; 14; 10 R4; 71 R2; 79; 364. **3.** 19; 31 R1; 15 R5; 237 R3; 137; 843. **4.** 14; 12 R1; 37 R1; 26; 185; 526 R3. **5.** 386; 129; 6723; 1084; 4773; 2182. **6.** 287; 52; 143; 3999; 535; 5389. **7.** 1324, 1227, 11,865, 7032, 9363, 6898; 913, 1124, 9857, 9267, 5465, 8183. **8.** 21 ÷ 3 = 7 (yd.); 7 × $.15 = $1.05. **9.** 4 × 45 = 180 (qt.). **10.** 19,808; 60,333; 77,958; 184,704. **11.** 4779; 41,625; 470,106; 63,036. **12.** 21,480; 16,065; 113,564; 91,760. **13.** 34,744; 20,318; 18,897; 16,157; 16,000; 11,285. **14.** 28,213; 24,349; 21,520; 21,000; 14,366; 12,910.

Page 57

Aims: To review basic vocabulary and to complete problems without numbers

Suggestions: Divide the work of this page into two parts. Have the pupils complete the vocabulary test orally. Remind them that the problems (13–19) are similar to those solved in Grade 4. After pupils indicate the process they would use to solve the problems, allow them to suggest numbers which could be inserted in these problems. A wise choice of numbers will reveal the extent to which a pupil understands the problem situation.

Key: 13. Add. **14.** Multiply. **15.** Subtract. **16.** Multiply. **17.** Divide. **18.** Subtract. **19.** Divide.

Pages 58–59

Aim: To reteach the calculation of averages

Suggestion: *American Arithmetic, Grade 4* devotes ample space to the teaching of this computation. The new idea on this page is the use of the word *per*. If the slower pupil has difficulty with *per*, allow him to substitute the word *a*. However, try to begin using this new word freely in the classroom, since it will appear frequently in upper grades.

Workbook Reference: Arithmetic Workshop, Book 5, page 16

Key: 2. $.75 + $1.00 + $.80 + $1.25 = $3.80; $3.80 ÷ 4 = $.95. **3.** 18 + 13 + 14 = 45 (tickets); 45 ÷ 3 = 15 (tickets). **4.** 85 ÷ 5 = 17 (tickets). **5.** 156 ÷ 4 = 39 (mi. per hour). **6.** 30¢ + 28¢ + 25¢ + 33¢ + 29¢ = 145¢; 145¢ ÷ 5 = 29¢. **7.** 50¢ + 23¢ + 7¢ + 28¢ = 108¢; 108¢ ÷ 4 = 27¢. **8.** $3.75 ÷ 3 = $1.25. **9.** $2.50 + $2.20 + $1.75 = $6.45; $6.45 ÷ 3 = $2.15. **10.** $12.85 ÷ 5 = $2.57.

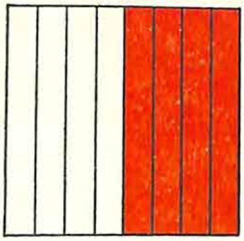
Page 60

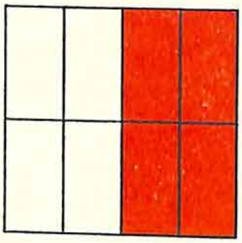
Aim: To reteach the concept of halves, fourths, eighths, and the words *fraction* and *one quarter*

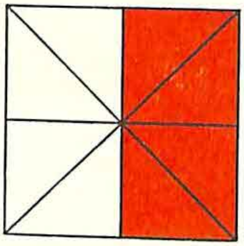
Suggestions: Emphasis should be placed on visualizing and relating fractional symbols to fractional amounts. Use a flannelboard with fractional parts or a ruler (large class ruler) to demonstrate the relative sizes of $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$. The activities suggested in ex. 6–7 can be readily extended.

Workbook Reference: Arithmetic Workshop, Book 5, page 26

Key: 1. 2; $\frac{1}{2}$; $\frac{1}{2}$. **2.** 4; $\frac{1}{4}$; $\frac{3}{4}$. **3.** Yes. **4.** 8; $\frac{3}{8}$; $\frac{5}{8}$. **5.** $\frac{2}{6}$; $\frac{4}{6}$. **6.** $\frac{3}{4}$; $\frac{1}{4}$. **7.** $\frac{4}{8}$; $\frac{2}{4}$; $\frac{1}{2}$.







Page 61

Aim: To extend the reteaching of fractions to include finding a part of a group of objects

Suggestions: This concept is a more difficult one than finding a fractional part of a single object, and pupils are carefully guided into finding $\frac{2}{3}$ of 27 (ex. 1) and $\frac{3}{4}$ of 36 (ex. 2). Have pupils talk out this work and complete all the examples on this page orally. Notice that beginning with ex. 8, each example develops the calculation in a systematic way; *i.e.*, $\frac{1}{5}$ of ——, $\frac{2}{5}$ of ——, $\frac{3}{5}$ of ——, and so on.

Key: **1.** $\frac{1}{3}$; $\frac{2}{3}$; 9; 9; 18; 27. **3.** $\frac{1}{3}$ of 12 eggs = 4 eggs, $\frac{2}{3}$ of 12 eggs = 8 eggs; $\frac{1}{4}$ of 12 eggs = 3 eggs, $\frac{3}{4}$ of 12 eggs = 9 eggs. **4.** $\frac{1}{3}$ of 12 in. = 4 in., $\frac{2}{3}$ of 12 in. = 8 in.; $\frac{1}{4}$ of 12 in. = 3 in., $\frac{3}{4}$ of 12 in. = 9 in. **5.** $\frac{1}{3}$ of 60¢ = 20¢; $\frac{2}{3}$ of 60¢ = 40¢. **6.** $\frac{1}{4}$ of 88¢ = 22¢; $\frac{3}{4}$ of 88¢ = 66¢. **7.** $\frac{1}{4}$ of 80¢ = 20¢; $\frac{3}{4}$ of 80¢ = 60¢. **8.** 4; 8; 16. **9.** 6; 30; 42. **10.** 5; 10; 15. **11.** 7; 14; 35. **12.** 2; 4; 14. **13.** 10; 30; 40. **14.** 9; 27; 45. **15.** 9; 36; 54.

Page 62

Aim: To teach a new meaning for a fraction

Suggestions: Through a careful study of ex. 1 and 2, the pupils can see that a fraction like $\frac{2}{3}$ may be used to indicate the division of 2 by 3; that is, $\frac{2}{3}$ means $2 \div 3$. The pupils thus see that a fraction is an expression of division. If the work on this page is considered along with that on pages 60 and 61, the pupils will see that a fraction like $\frac{2}{3}$ can have any one of three different meanings, depending upon the situation. These meanings are as follows:

(1) $\frac{2}{3}$ may represent $\frac{2}{3}$ of a single object.
(2) $\frac{2}{3}$ may represent $\frac{2}{3}$ of a group of objects, as in $\frac{2}{3}$ of 6 pencils.
(3) $\frac{2}{3}$ may indicate $2 \div 3$.

Ex. 7 on this page shows that a whole number like 5 can be written in the form of a fraction, like this: $\frac{5}{1}$. In later work in fractions, the pupils will often find it convenient to write a whole number in this way.

Key: **3.** $\frac{1}{2}$. **4.** $\frac{2}{5}$. **5.** $\frac{3}{4}$. **6.** $\frac{4}{5}$. **8.** $\frac{4}{5}$; $\frac{2}{3}$; $\frac{10}{3}$; $\frac{16}{5}$; $\frac{3}{1}$. **9.** $\frac{5}{7}$; $\frac{1}{4}$; $\frac{15}{2}$; $\frac{12}{5}$; $\frac{8}{1}$. **10.** $\frac{1}{5}$; $\frac{6}{1}$; $\frac{12}{7}$; $\frac{13}{4}$; $\frac{7}{1}$. **11.** $\frac{4}{3}$; $\frac{7}{4}$; $\frac{11}{3}$; $\frac{17}{2}$; $\frac{5}{1}$.

Page 63

Aim: To show how a remainder may be expressed as a fraction in the quotient

Suggestions: This work is important since many of the later exercises in division will have remainders expressed as fractions in the quotient. In ex. 3–9 on this page the fractions in the answers do not require changing to lowest terms.

Key: **3.** $6\frac{1}{5}$; $46\frac{1}{2}$; $73\frac{5}{6}$; $53\frac{5}{8}$; $64\frac{1}{9}$; $69\frac{3}{4}$. **4.** $8\frac{1}{6}$; $7\frac{6}{7}$; $25\frac{5}{9}$; $286\frac{2}{3}$; $97\frac{4}{5}$; $58\frac{4}{7}$. **5.** $9\frac{4}{9}$; $18\frac{2}{5}$; $87\frac{1}{2}$; $235\frac{1}{4}$; $121\frac{2}{7}$; $97\frac{2}{3}$. **6.** $29\frac{1}{2}$; $9\frac{3}{8}$; $74\frac{3}{4}$; $49\frac{1}{6}$; $54\frac{1}{3}$; $47\frac{7}{8}$. **7.** 5 yd. ÷ 2 = $2\frac{1}{2}$ yd. **8.** 9 yd. ÷ 8 = $1\frac{1}{8}$ yd. **9.** $3\frac{7}{8}$ yd., $7\frac{7}{8}$ yd.

Page 64

Aim: To show when to express a remainder in division as a fraction in the quotient

Suggestion: The work on this page requires careful study and should be discussed fully with the pupils so that they can see that it is not always sensible to express a remainder as a fraction in the quotient. Sometimes a remainder should be left as a remainder.

Workbook Reference: Arithmetic Workshop, Book 5, page 27

Key: **1.** No. **2.** Yes. **4.** 17 marbles, 1 over; $1\frac{1}{4}$ oranges. **5.** $1\frac{3}{4}$ yd.; 8¢, 1¢ over. **6.** 3 Christmas bells, 1 Christmas bell over. **7.** 9 bunches of carrots, 3 carrots over. **8.** $1\frac{3}{8}$ yd.

Page 65

Aim: To review fundamental skills in addition, subtraction, and multiplication

Workbook Reference: Arithmetic Workshop, Book 5, page 24

Key: **1.** 359; 2400. **2.** 300; 2095. **3.** 280; 2647. **4.** 347; 2506. **5.** 339; 2682. **6.** 361; 3182. **7.** 348; 2996. **8.** $85.09. **9.** $5.02. **10.** 3524; 1688; 2794; 1323; 3429. **11.** 8079; 1766; 5283; 4305; 546. **12.** 2698; 668; 517; 257; 356. **13.** 2760; 9555. **14.** 6324; 3250; 11,628; 39,765; 32,942; 844,094. **15.** 1798; 7144; 12,336; 14,181; 120,013; 492,108. **16.** 5952; 2262; 31,068; 36,624; 267,844; 220,176.

Pages 66–67

Aim: To extend multiplication to 3-figure multipliers and 3-figure multiplicands

Suggestions: The important thing in teaching multiplication with 3-figure multipliers is to teach the pupils to place each of the partial products in the correct position so that the right-hand figure of each partial product comes directly under the figure by which the pupil is multiplying. The model example in ex. 1 on page 66 should be studied carefully, as should the four model examples in ex. 2.

Attention is called to the method by which the model example in ex. 1 on page 66 has been checked. You see that the multiplicand and the multiplier have been interchanged so that 198 is multiplied by 245. Since the product obtained in this way is the same as it was in the original multiplication, the answer is called right. This method of checking multiplication examples by interchanging the numbers and multiplying again is especially recommended when both multiplicand and multiplier have the same number of figures. The new method of checking interests pupils because of the fact that the products always come out the same. It also has the merit that it doubles the amount of multiplying and thereby provides much additional drill. The pupils do not seem to be bored by this additional drill since they are interested to see whether the product comes out as it did in the original multiplication. This work applies the commutative principle. Review with the pupils the meaning and application of this principle.

Workbook Reference: Arithmetic Workshop, Book 5, page 17

Key: Page 67 **1.** $473.75. **2.** $45,825. **3.** $696.50. **4.** 156,960 eggs. **5.** $211.60. **6.** 71,451; 249,128; 35,621; 98,358; 305,492; 28,124. **7.** 68,666; 101,515; 116,622; 296,514; 176,402; 167,325. **8.** 57,915; 126,768; 219,024; 436,581; 58,512; 189,588. **9.** 158,976; 76,300; 47,628; 334,371; 331,692; 517,998. **10.** 363,053; 873,901; 641,568; 33,489; 72,217; 281,394. **11.** 359,154. **12.** 208,026. **13.** 201,106.

Page 68

Aim: To present word problems containing extra facts

Suggestions: *American Arithmetics* develop in a careful and thorough manner the skills needed in solving word problems. Up to this point, the pupil has been taught the following:

1. To solve one-step problems
2. To use specific thought patterns in addition, subtraction, multiplication, and division
3. To complete one-step problems by suggesting the question to be answered
4. To solve two-step problems
5. To understand problems without numbers

Now a sixth step is to be taken — to solve problems which contain extra facts. In reality, the everyday problem situations which challenge child and adult are full of relevant as well as irrelevant facts. One of the skills of problem solving is to cast aside the irrelevant and work with the relevant. This type of problem situation is created to give pupils practice in ascertaining which facts are real — pertinent — and necessary; which facts are unreal and unnecessary.

Workbook Reference: Arithmetic Workshop, Book 5, page 45

Key: **1.** 19 + 17 = 36 (eggs); 36 − 30 = 6 (eggs). **2.** "2 Saturday mornings" and "5 days" not needed; $19.00 − $9.75 = $9.25. **3.** ½ × $.90 = $.45; $.45 + $.29 = $.74. **4.** "$1.25" and "$.65" not needed; $1.90 + $.29 = $2.19. **5.** "4 yd.," "2 yd.," and "8 buttons" not needed; $7.92 + $1.98 + $1.25 = $11.15. **6.** "$6.50" not needed; $20.00 − $17.75 = $2.25. **7.** "$.85" not needed; 3 × $1.62 = $4.86. **8.** $.75 + $.50 = $1.25. **9.** $1.50 + $1.25 + $2.20 = $4.95; $4.95 ÷ 3 = $1.65.

Page 69

Aim: To reteach the use of zeros in multiplication

Suggestions: In all the examples on this page, zero is a place holder. Stress this idea. Encourage pupils to avoid the use of extra zeros (as illustrated in A at the top of the page). If pupils do not wish to use the offset method for writing the multiplier, allow them to line up the figures in the usual way.

Workbook Reference: Arithmetic Workshop, Book 5, page 43

Key: **3.** 465,836; 70,788; 170,968; 119,700; 291,870; 159,040. **4.** 22,042; 340,938; 579,840; 498,330; 67,490; 78,570. **5.** 517,880; 155,956; 86,546; 428,750; 668,960; 134,270.

Page 70

Aim: To provide an oral review

Key: **1.** 37, 71, 36, 49, 85, 24, 60, 93; 39, 73, 38, 51, 87, 26, 62, 95; 40, 74, 39, 52, 88, 27, 63, 96; 50, 84, 49, 62, 98, 37, 73, 106. **2.** 28, 54, 25, 42, 91, 46, 83, 69; 30, 56, 27, 44, 93, 48, 85, 71; 31, 57, 28, 45, 94, 49, 86, 72; 41, 67, 38, 55, 104, 59, 96, 82. **3.** 21, 55, 20, 33, 69, 8, 44, 77; 12, 38, 9, 26, 75, 30, 67, 53. **4.** 370, 820, 160, 490, 600, 250. **5.** 2800, 1400, 3000, 3600, 4300, 5700. **6.** 3, 5, 7, 9, 10, 12. **7.** 6, 12, 18, 27, 21, 30. **8.** 4 qt., 24 qt. **9.** 4 gal., 8 gal. **10.** 5 yd., 9 yd. **11.** 12 oz., 14 oz. **12.** Divisor. **13.** 1. **14.** 39, 79, 23, 71, 47, 63, 55, 7, 31. **15.** 25¢ ÷ 3¢ = 8 (candies), 1¢ over. **16.** 3 ÷ 2 = 1½ (apples). **17.** 5 ÷ 2 = 2 (marbles), 1 marble over. **18.** 6¢ + 2¢ + 7¢ = 15¢; 15¢ ÷ 3 = 5¢. **19.** $6 ÷ 2 = $3. **20.** 5¢ + 8¢ = 13¢; 25¢ − 13¢ = 12¢.

Page 71

Aim: To introduce timed tests on the four fundamental operations with whole numbers

Suggestions: On this page timed tests are introduced. The purpose of these tests and the method of giving them is fully discussed on pages 328–329 of the text, to which you are referred. Directions for using folded paper are given on page 328. A class of average ability should be able to do these tests in the time assigned. You may, however, modify the times indicated if modification seems necessary. If your class is below average in ability, you may omit the time element entirely, using the tests as regular tests. It is very desirable, however, to have a time limit on these tests if conditions in your class permit.

Key: **1.** 2029; 1648; 2437; 2908; 2614; 3000. **2.** 119; 79; 158; 170; 235; 199. **3.** 17; 299; 356; 43; 196; 98. **4.** 12,412; 10,863; 49,011; 11,194; 21,666; 55,835. **5.** 876; 465; 235 R3; 568. **6.** 346 R1; 834; 476; 839.

Page 72

Aim: To review some of the major aims of Chapter 2

Suggestion: This page reviews six of the twelve major aims listed in this Guide at the beginning of Chapter 2. These are:

Chapter Review	*Aim Number*
Ex. 1–5	5
Ex. 2	8
Ex. 3, 4, 6	1
Ex. 7–10	7 and 8
Ex. 11–13	3 and 6

Aims 9 and 10 are reviewed in the test on page 73.

Key: **1.** 25 + 31 + 24 + 28 = 108 (eggs); 108 ÷ 4 = 27 (eggs). **2.** $\frac{3}{4}$ lb. = 12 oz.; Ann had 2 oz. less, since 12 oz. − 10 oz. = 2 oz. **3.** 40 ÷ 3 = 13 (marbles), 1 marble over. **4.** 20 yd. ÷ 3 = $6\frac{2}{3}$ yd. **5.** \$22.80 ÷ 6 = \$3.80. **6.** 2 × \$.39 = \$.78; \$1.00 − \$.78 = \$.22. **7.** 7; 21; 7; 21; 35. **8.** 8; 16; 8; 24; 32. **9.** 9; 45; 6; 18; 24. **10.** 21; 63; 12; 24; 36. **11.** \$147.90; \$1103.52; 185,654; 34,000; 303,215; 17,700. **12.** \$208.00; \$905.76; 249,090; 278,613; 488,196; 55,800. **13.** \$91.20; \$931.14; 91,968; 258,587; 131,150; 27,200.

Page 73

Aim: To give Problem Test 2

Suggestion: See instructions in this Guide for page 43.

Workbook Reference: Arithmetic Workshop, Book 5, page 51

Key: **1.** 1 doz. = 12; 12 × \$.09 = \$1.08; \$1.08 − \$.98 = \$.10. **2.** 30 + 26 + 31 + 31 + 32 = 150 (children); 150 ÷ 5 = 30 (children). **3.** 49¢ ÷ 5 = $9\frac{4}{5}$¢. **4.** $\frac{1}{4}$ × \$.80 = \$.20; $\frac{3}{4}$ × \$.80 = \$.60. **5.** \$2.43 ÷ 9 = \$.27. **6.** 112 − 16 = 96 (cookies). **7.** 500 ÷ 3 = 166 (stamps), 2 stamps over. **8.** Estimate: 19 mi. is about 20 mi.;

$20 \times 16 = 320$ (mi.). Exact answer: $19 \times 16 = 304$ (mi.). **9.** $\$29.20 \div 8 = \$3.65$. **10.** $\$.75 + \$.15 + \$.25 + \$.69 = \$1.84$; $\$3.00 - \$1.84 = \$1.16$.

Page 74

Aim: To provide a diagnostic test in arithmetic skills

Suggestion: Each pupil should make his own decision concerning additional help needed in a given area. The work on this page is carefully arranged and graded from simple to difficult.

Key: **1.** 6; 12; 18; 24. **2.** 9; 27; 45; 63. **3.** 6; 30; 6; 12. **4.** $68\frac{1}{5}$; $59\frac{2}{7}$; $87\frac{3}{4}$; $128\frac{1}{2}$. **5.** $35\frac{5}{8}$; $74\frac{4}{9}$; $93\frac{5}{6}$; $65\frac{2}{3}$. **6.** 1482; 5395; 29,452; 4522. **7.** 141,245; 588,892; 85,729; 183,792. **8.** 18,900; 38,220; 56,400; 26,700. **9.** 51,256; 160,545; 268,336; 223,136. **10.** 664,335; 259,081; 537,586; 132,480. **11.** $16 + 10 + 15 + 19 = 60$, $60 \div 4 = 15$; $73 + 82 + 67 + 80 + 83 = 385$, $385 \div 5 = 77$.

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Chapter 3

Aims of Chapter 3. The major aims of Chapter 3 are to:

1. Review the fundamental skills taught in Chapters 1 and 2.
2. Teach division by even tens.
3. Teach division by 2-figure numbers ending in 1–5 where no correction is needed.
4. Teach division by 2-figure numbers ending in 1–5 where one correction is needed.
5. Teach division by 2-figure numbers ending in 1–5 where two corrections are needed.
6. Reteach and extend measures of time.
7. Reteach dry measures.
8. Reteach multiplication by 11 and 12.
9. Teach division by 11 and 12.

Pages 75–76

Aim: To present word problems dealing with mail delivery in early days

Suggestions: Most pupils enjoy watching television programs dealing with the days of the early West; thus, post riders and the Pony Express are not new to them. The problems on these pages bring into focus another aspect of history. The facts have been carefully verified. Problem 3 is stated in terms of flying time at a given year. As new planes are invented, the flying time will decrease. Pupils living in the New York or Boston area may ascertain the exact flying time of the New York-Boston plane and thus change to present-day schedules the facts given in problem 3.

Workbook Reference: Arithmetic Workshop, Book 5, page 85

Key: Page 75 **1.** (1) $\frac{1}{2} \times 234$ mi. = 117 mi.; (2) 6 da. **2.** (1) 13 da.; (2) 2×117 mi. = 234 mi. **3.** 1 hr. = 60 min.; 60 min. + 5 min. = 65 min.

Page 76 **1.** $1860 - 1673 = 187$ (years). **2.** $1950 \div 7 = 278\frac{4}{7}$; $1950 \div 8 = 243\frac{6}{8}$; $1950 \div 9 = 216\frac{6}{9}$. *Answer:* About 8 times. **3.** 5×10 mi. = 50 mi. **4.** 13×15 mi. = 195 mi.; 13×18 mi. = 234 mi.; 13×20 mi. = 260 mi. *Answer:* 18 mi. **5.** 1950 mi. $\div$ 9 = $216\frac{6}{9}$ mi.; 1950 mi. $\div$ 10 = 195. *Answer:* 10 da. **6.** (1) $2 \times \$5.00 = \$10.00$; (2) $4 \times \$5.00 = \$20.00$.

Page 77

Aim: To present problems dealing with tropical fish

Suggestions: The raising of tropical fish is becoming a common hobby; many homes have tanks of tropical fish. If your classroom has a fish hobbyist enrolled, he may be very happy to tell about the challenges and fun in raising tropical fish. From such a discussion, many additional problems may arise. The facts found in problems 1–3 serve as a good introduction to the teaching program launched on page 78, which deals with division by even tens.

Key: **3.** \$1.50 − \$.40 = \$1.10; \$1.10 − \$.40 = \$.70; \$.70 − \$.40 = \$.30; Jean could buy 3 fish and have \$.30 left over.

Pages 78–80

Aim: To teach division by even tens

Suggestions: Ex. 1 on page 78 teaches the six steps involved in completing long-division examples. Dividing by even tens is in reality 1-figure division extended to the tens place. This understanding should be emphasized as ex. 2–5 are completed by the pupils. As a pupil does ex. 2–5, give him an opportunity to think aloud somewhat as follows:

$20\overline{)67}$ 6 tens divided by 2 tens = 3.

$40\overline{)93}$ 9 tens divided by 4 tens = 2.

$30\overline{)97}$ 9 tens divided by 3 tens = 3.

After the examples have been completed orally, have the pupils complete them in writing as shown in the illustrative example at the top of the page. Then have the pupils check each example by multiplication. Before proceeding farther, you will find it useful to know the basis for the treatment of long division as developed in *American Arithmetics.*

The Teaching of Long Division. Long division is the most difficult operation with whole numbers, not only for children but also for adults. The hardest part of long division is in estimating the correct quotient figures. In this book, long division is taught by a method that gives the correct quotient figure *on first trial* in 80% of all cases. In the remaining 20% of cases, the correct quotient figure is found, with very minor exceptions, after a single correction of the trial quotient figure. The procedure so often used, by which the pupil tries first one quotient figure and then another until he finds the correct one, is thus avoided.

In order to obtain such high efficiency in finding quotient figures, this book uses two rules for estimating quotient figures. One of these rules applies to 2-figure divisors ending in 1 to 5; the other rule applies to 2-figure divisors ending in 6 to 9. In this Guide these rules, for convenience, will be called Rule I (divisors ending in 1 to 5) and Rule II (divisors ending in 6 to 9).

The work on long division as given here starts by showing how to use Rule I in cases requiring no correction of quotient figures, then in cases requiring one correction, and then in cases requiring two corrections. Rule II is then taken up in similar manner, first with no correction of quotient figures, then with one correction, and then with two corrections. In this way the pupil masters the art of finding the correct quotient figure *on first trial* in 80% of all cases.

There are other troublesome situations in long division besides those relating to quotient figures. Hence, the various difficulties of long division are distributed over several chapters of this book. This topic is kept alive and extended throughout the entire year to avoid teaching all the work in a single chapter. The distribution of the work on long division, as given in this book, is shown on page 36.

Chapter	*Pages*	
3	77, 78–81, 84–87, 90, 98–99	2-figure divisors ending in 1 to 5 with no correction of quotient figures
3	94–95	2-figure divisors ending in 1 to 5 with one correction of quotient figures
3	100	2-figure divisors ending in 1 to 5 with two corrections of quotient figures
5	153–157, 159	2-figure divisors ending in 6 to 9 with no correction of quotient figures
5	166–167	2-figure divisors ending in 6 to 9 with one correction of quotient figures
5	174–175	The troublesome divisors 13 to 19
5	178	Using 9 as a quotient figure

Before starting to teach long division as developed in this book, you will find it profitable first to look over the distribution of the work as outlined above to see how carefully each difficulty of this subject is met.

The treatment of long division as given in *American Arithmetics* is one of the outstanding features. For a more detailed discussion of this highly efficient method of long division, see pages 4–5 of this Guide.

Key: Page 78 **2.** 3 R7; 2 R13; 3 R7; 4; 2 R7. **3.** 3 R3; 2 R17; 1 R32; 3 R8; 1 R14. **4.** 2 R9; 2 R10; 2 R6; 2 R12; 2 R6. **5.** 2 R5; 1 R21; 2 R27; 2 R5; 4 R5.

Page 79 **1.** 80 ÷ 40 = 2 (bus loads). **2.** 90 ÷ 30 = 3 (tickets). **3.** 60¢ ÷ 20¢ = 3 (boxes of cookies). **4.** 2 R4; 2 R3; 2 R1; 1 R46; 3 R16. **5.** 2 R15; 3 R8; 2 R3; 1 R15; 2 R2. **6.** 1 R25; 2 R13; 1 R30; 1 R32; 1 R24. **7.** 1 R34; 4 R11; 1 R40; 2 R7; 2 R2. **8.** 1 R39; 2 R10; 2 R5; 1 R27; 1 R30. **9.** 2; 1 R19; 1 R24; 2 R1; 2 R11; 1 R13; 1 R31. **10.** 1 R45; 1 R34; 1 R29; 1 R18; 1 R47; 1 R24; 1 R13. **11.** 3; 2 R6; 1 R17; 2 R4; 3 R2; 1 R20; 2 R17. **12.** 60¢ ÷ 20¢ = 3 (tickets); 90¢ ÷ 20¢ = 4 (tickets), 10¢ over. **13.** 60¢ ÷ 30¢ = 2 (tickets).

Page 80 **2.** 150 ÷ 30 = 5 (things). **3.** 180 ÷ 20 = 9 (packages). **4.** 7; 6; 4 R3; 8 R7; 7. **5.** 7 R9; 6; 5 R3; 7; 9 R13. **6.** 2 R37; 6 R13; 8 R11; 5; 9 R13. **7.** 7 R11; 9 R17; 9; 7 R13; 4. **8.** 5 R11; 8; 6 R17; 9 R9; 8 R37. **9.** 5; 6 R13; 9; 8; 8 R11. **10.** 7 R5; 6 R3; 5 R23; 8 R7; 9. **11.** 4; 6 R19; 7 R33; 9; 3 R7.

Page 81

Aim: To introduce 2-figure divisors ending in 1

Suggestion: In most of the exercises on this page, the first figure of the dividend is smaller than the first figure of the divisor; hence, it is necessary to divide the first two figures of the dividend by the first figure of the divisor in order to find the quotient. All the quotients are 1-figure numbers that require no correction.

Workbook Reference: Arithmetic Workshop, Book 5, pages 18 and 19

Key: **2.** 217 qt. ÷ 31 = 7 qt. **3.** 150 qt. ÷ 30 = 5 qt. **4.** 180 gal. ÷ 20 = 9 gal. **5.** 3; 8; 6; 7; 4. **6.** 2 R5; 8 R11; 6; 6; 9. **7.** 4 R1; 8 R29; 5; 6 R3; 5 R17.

8. 3; 6 R16; 7; 9 R3; 6 R4. **9.** 6; 9; 5 R2; 3 R18; 4 R13; 6 R13. **10.** 4; 9; 5 R4; 3 R7; 7; 8 R5. **11.** 6 R3; 9; 6 R4; 8 R10; 5 R11; 7 R3. **12.** 5; 6 R8; 9 R3; 8 R3; 3 R4; 7. **13.** 3; 5 R3; 8; 2 R2; 7; 9.

Page 82

Aim: To provide an oral review

Key: **1.** 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98; 120, 123, 126, 129, 132, 135, 138, 141, 144, 147, 150, 153, 156. **2.** 82, 86, 90, 94, 98, 102, 106; 81, 87, 93, 99, 105, 111, 117, 123, 129, 135. **3.** 24, 49, 83, 42, 31, 90, 18, 57; 25, 50, 84, 43, 32, 91, 19, 58; 26, 51, 85, 44, 33, 92, 20, 59; 29, 54, 88, 47, 36, 95, 23, 62. **4.** 76, 95, 62, 94, 50, 39, 33, 71; 77, 96, 63, 95, 51, 40, 34, 72; 78, 97, 64, 96, 52, 41, 35, 73; 81, 100, 67, 99, 55, 44, 38, 76. **5.** 17, 15, 11. **6.** 19, 21, 15. **7.** 17, 17, 17. **8.** 9, 6, 22, 87, 72. **9.** 9, 7, 36, 47, 39. **10.** 9, 8, 81, 26, 37. **11.** 370, 490, 180, 700, 520. **12.** 6100, 2600, 8300, 9500, 7400. **13.** 12, 18, 8, 20, 6, 14. **14.** $31 \div 7 = 4$ (wk.), 3 da. over. **15.** 2 dimes = 20¢; 20¢ $\div 3 = 6$ (stamps), 2¢ over. **16.** 25¢ $\div 4 = 6\frac{1}{4}$¢. **17.** 38, 39, 40, 50; 22, 23, 24, 25, 50. **18.** 27 min. **19.** 4 qt.; 3 qt. **20.** $\frac{1}{4} \times 36$ in. = 9 in.; $\frac{3}{4} \times 36$ in. = 27 in. **21.** 16 oz. = 1 lb.; $\frac{5}{8} \times 16$ oz. = 10 oz.

Page 83

Aim: To present problems dealing with earning money

Suggestions: Before the pupils begin these problems, have them discuss various ways they earn money. As an illustration is given, write it on the blackboard. After the children have completed the seven problems in the textbook, let them turn to the problems suggested by class members.

Workbook Reference: Arithmetic Workshop, Book 5, page 11

Key: **1.** \$4.50 + \$3.85 + \$4.75 + \$3.45 = \$16.55. **2.** 25 × \$.80 = \$20.00; \$20.00 − \$6.75 = \$13.25. **3.** 54 × \$.60 = \$32.40. **4.** 18 × \$1.15 = \$20.70; \$20.70 + \$9.75 = \$30.45. **5.** \$78 ÷ 3 = \$26. **6.** $\frac{1}{5}$ × \$47.25 = \$9.45. **7.** \$13.50 + \$15.00 = \$28.50; \$28.50 − \$10.30 = \$18.20.

Pages 84–86

Aim: To extend long division to divisors ending in 1, 2, 3, 4, or 5 and to 2-figure quotients where each figure of the quotient is found correctly on the first trial

Suggestions: On page 84 the model example requires careful study. You will find it helpful if you write this model example on the blackboard and point out the various steps that are necessary to get the two quotient figures. Attention is called to the five steps that are necessary in finding each quotient figure. These steps are (1) divide; (2) multiply; (3) subtract; (4) compare; and (5) bring down. Do not neglect step 4, which is a comparison of the remainder with the divisor. If the remainder is less than the divisor, the quotient figure is right.

On page 85 the rule is given for estimating quotient figures in all cases where a 2-figure divisor ends in 1, 2, 3, 4, or 5. For convenience in this Guide, this rule will hereafter be referred to as Rule I. All the exercises on page 85 are such that the correct quotient figure is always found on the first trial by following Rule I. In other words, no correction of quotient figures is necessary in these exercises.

Workbook Reference: Arithmetic Workshop, Book 5, pages 20, 21, and 25

Key: Pages 84–85 **2.** 987 ÷ 21 = 47 (lb.). **5.** 32; 21 R7; 12; 42 R4; 34 R9. **6.** 23 R12; 33 R3; 21; 12; 13. **7.** 23 R3; 21 R11; 22; 21; 34 R11. **8.** 13; 14; 12; 12 R5; 12 R4. **9.** 903 ÷ 21 = 43 (pencils).

Page 86 **2.** 2088 ÷ 31 = 67 (tickets), 11 tickets over; 11 rooms should sell one extra ticket. **3.** 52; 86; 72; 44; 51 R2. **4.** 42; 45 R3; 96; 31; 32. **5.** 63; 23 R4; 81; 43; 71 R12. **6.** 33 R11; 57 R13; 51; 63; 63. **7.** 52; 62 R7; 53 R2; 36; 51. **8.** 71 R8; 52 R4; 25 R5; 41 R9; 33 R3. **9.** 24; 36; 45; 51 R7; 62. **10.** 45; 54; 83; 93; 76 R2.

Page 87

Aim: To review basic addition, subtraction, multiplication, and long-division skills

Workbook Reference: Arithmetic Workshop, Book 5, page 28

Key: **1.** 34,153; 127,215; $5830.50; $1789.42. **2.** 15,447; 172,072; $3058.70; $1103.70. **3.** 37,392; 604,428; $3425.04; $2059.20. **4.** 49,910; 170,156; $3970.68; $963.60. **5.** 328; 325. **6.** 358; 333. **7.** 299; 384. **8.** 363; 321. **9.** 250 × $3.98 = $995.00. **10.** $5.21. **11.** $6.81. **12.** 1684; 982; 1657; 1547; 458. **13.** 766; 2990; 104; 1688; 165. **14.** 56 R3; 118; 75; 262 R4; 51. **15.** 97; 98; 64; 257; 84. **16.** 25 R5; 70; 87; 163; 62 R11. **17.** 87 R2; 86; 54; 341 R1; 52 R20.

Pages 88–89

Aim: To introduce distance, rate, and time problems

Suggestion: The work on these pages is very important since problems in finding distances, rates, and times in connection with travel by air, land, and sea occur frequently in the work of Grades 5 through 8.

Key: Page 88 **1.** (1) 2 × 17 mi. = 34 mi.; (2) 3 × 17 mi. = 51 mi. **2.** (1) 2 × 45 mi. = 90 mi.; (2) 3 × 45 mi. = 135 mi. **3.** 60 mi. per hr. **4.** (1) 2 × 60 mi. = 120 mi.; (2) $\frac{1}{2}$ × 60 mi. = 30 mi.; (3) $\frac{3}{4}$ × 60 mi. = 45 mi. **5.** 2 × 3 mi. = 6 mi. **6.** (1) 2 × 4 mi. = 8 mi.; (2) $\frac{1}{2}$ × 4 mi. = 2 mi.; (3) $\frac{1}{4}$ × 4 mi. = 1 mi. **7.** (1) 2 × 175 mi. = 350 mi.; (2) 3 × 175 mi. = 525 mi.

Page 89 **1.** 12 mi. ÷ 2 = 6 mi. **2.** Divide; 2340 mi.; 1134 mi. **3.** 2340 mi. ÷ 4 = 585 mi. **4.** 1134 mi. ÷ 21 = 54 mi. **5.** 200 mi. ÷ 40 mi. = 5 (hr.). **6.** (1) 14 mi. ÷ 7 mi. = 2 (hr.); (2) 21 mi. ÷ 7 mi. = 3 (hr.); (3) 28 mi. ÷ 7 mi. = 4 (hr.).

Page 90

Aim: To introduce the division of dollars and cents with 2-figure divisors and 2-figure quotients

Suggestions: The model example in ex. 1 should have careful study. In this work it is very important that the first figure of the quotient be placed in the right position — over the last figure of the partial dividend that was used to obtain the quotient figure. In the model example, the 2 in the quotient is written over the 7 of the dividend. If the first figure of the quotient is written in the wrong position, the decimal point in the quotient will then fall in the wrong position and the answer will be wrong. In ex. 3–11 on this page, attention is called to the fact that only the dividends involve dollars and cents. The divisors are all abstract numbers.

Key: **2.** \$23.76 ÷ 33 = \$.72. **3.** \$.14; \$.82; \$.36; \$.91. **4.** \$.13; \$.38 R11¢; \$.54; \$.63. **5.** \$.16; \$.53; \$.47 R3¢; \$.64. **6.** \$.15; \$.61; \$.56 R16¢; \$.56 R11¢. **7.** \$.22; \$.72 R8¢; \$.45 R12¢; \$.82. **8.** \$.21; \$.52 R7¢; \$.33; \$.33. **9.** \$.17 R5¢; \$.72; \$.24 R7¢; \$.47. **10.** \$.15 R2¢; \$.18; \$.26; \$.32 R7¢. **11.** \$.31 R5¢; \$.53 R8¢; \$.34; \$.61.

Page 91

Aim: To provide further practice in solving word problems

Suggestion: The problems on this page deal with a great variety of subjects and are designed merely as review problems.

Workbook Reference: Arithmetic Workshop, Book 5, page 29

Key: **1.** 1364 ÷ 22 = 62 (papers). **2.** $\frac{3}{4}$ × \$.80 = \$.60. **3.** 8450 mi. − 6785 mi. = 1665 mi. **4.** \$19.75 + \$9.89 = \$29.64. **5.** 3 × \$4.75 = \$14.25; \$20.00 − \$14.25 = \$5.75. **6.** 82 + 87 + 88 + 91 = 348; 348 ÷ 4 = 87. **7.** 20 × \$.63 = \$12.60; \$12.60 − \$10.45 = \$2.15. **8.** 175 × \$1.56 = \$273.00. **9.** \$1020 ÷ 30 = \$34. **10.** 550 ÷ 25 = 22 (boxes); 22 × \$.98 = \$21.56. **11.** 300 cookies ÷ 21 = 14 cookies, 6 cookies over. **12.** 85 × \$1.19 = \$101.15.

Page 92

Aim: To provide an oral and a written review

Key: **1.** Eleven forty, 40 minutes past 11, 20 minutes to 12. **2.** 11. **3.** 49, 45. **4.** 45. **5.** 9 × 3 ft. = 27 ft.; 6 × 3 ft. = 18 ft. **6.** 9 ft. ÷ 3 ft. = 3 (yd.); 6 ft. ÷ 3 ft. = 2 (yd.). **7.** $\frac{1}{2}$ pie. **8.** 4, 0, 0, 4. **9.** 45 min. **10.** 10 qt. = $2\frac{1}{2}$ gal., 3 gal. is more; 2 ft. = 24 in., 2 ft. is more. **11.** 2 hr. 20 min. + 30 min. = 2 hr. 50 min., or 2 : 50. **12.** 63. **13.** 15,554. **14.** 3635. **15.** 73 + 68 + 50 + 86 + 75 + 80 = 432; 432 ÷ 6 = 72. **16.** \$30.77. **17.** 260,403; 129,052. **18.** 5123. **19.** 26; 87. **20.** 3006. **21.** 1185. **22.** $\frac{3}{4}$ × \$.80 = \$.60. **23.** 306.

Page 93

Aim: To reteach measures of time and extend the teaching to include the new concepts *century*, *decade*, and *score*

Suggestions: The measures of time that have been used so far should be known to pupils. The new terms, however, are not commonly used. One hundred years is a long time, and children at the age of 10 years do not think meaningfully in terms of a century. A decade could mean to most of them the entire length of their life, and a score could represent their age at the time they would be in college. Teachers will find that these new terms are not readily comprehended by the average and below-average pupil, and should present them here more from an appreciation than from a mastery point of view.

Key: **3.** 1860; 1908; 1932; 1948; 1960; 2000. **4.** 4 score = 80 yr., 80 yr. + 2 yr. = 82 yr.; 6 decades = 60 yr.; 3 score and 10 yr. = 70 yr.; 5 decades = 50 yr.; 2 decades = 20 yr. **5.** 2 centuries; 5 centuries.

Pages 94–95

Aim: To teach the correction of quotient figures

Suggestions: A careful study must be made of the model example in ex. 1. Writing this example on the blackboard and pointing out the steps required to work it will be very helpful. In all the previous work in long division given in this book, no correction of quotient figures has been necessary; that is, the correct quotient figure was found on the first trial. On page 94 for the first time it is necessary to correct quotient figures. Attention is called to the fact that each of the 2-figure divisors in ex. 2–7 ends in 1 to 5, which means that Rule I is still being used. Page 95 extends the work of page 94 to examples having 2-figure quotients. In ex. 3–9 on page 95, Rule I is still used to find the quotient figures.

Key: Page 94 **2.** 210 ÷ 35 = 6 (groups). **3.** 6 R17; 7 R15; 8; 5 R25; 7 R33. **4.** 8 R27; 7 R15; 8 R32; 5; 5 R20. **5.** 6 R22; 8 R17; 4 R19; 4 R20; 4 R20. **6.** 6 R5; 6 R47; 8 R12; 7 R17; 6. **7.** 5 R60; 6 R12; 5 R31; 7 R2; 4 R17.

Page 95 **2.** 910 ÷ 35 = 26 (packages). **3.** 27; 77 R23; 54 R5; 78 R32; 44. **4.** 24; 54; 75; 78; 44 R37. **5.** 26 R24; 78; 67; 67 R39; 57 R27. **6.** 25; 85 R15; 83 R52; 66; 36. **7.** 17 R9; 75 R21; 48; 66 R42; 88 R9. **8.** 19; 39 R1; 55; 74 R10; 55 R40. **9.** 32; 62 R27; 73 R19; 46 R36; 53 R20.

Pages 96–97

Aim: To reteach dry measure

Suggestions: The teaching of the terms *quart*, *peck*, and *bushel* was begun in Chapter 8 of *American Arithmetic, Grade 4,* and therefore these learnings may not be clearly established in the minds of the pupils. This work is best approached as new teaching, since most commercial use of dry measures is confined today to weight. Potatoes, apples, and many other commodities are now sold almost exclusively by weight, whereas twenty years ago the peck and the bushel were commonly used. Today hardly any use is made of peck and bushel measures. The scales have taken the place of the wooden containers so often found at roadside markets or in small grocery stores. Problem 9 on page 97 points up this shift in emphasis, and problems 10 and 11 tend to send pupils on research trips to ascertain that dry measure as such is now seldom found in American commercial establishments.

Key: **4.** (1) 8 qt.; (2) 32 qt.; (3) 32 qt. **5.** (1) 4 × \$1.00 = \$4.00; (2) 4 × \$1.00 = \$4.00. **6.** 8 × \$.15 = \$1.20. **7.** (1) 4 × \$1.00 = \$4.00, \$4.00 − \$3.75 = \$.25; (2) 32 × \$.15 = \$4.80, \$4.80 − \$3.75 = \$1.05. **12.** 8; 4; 1. **13.** 64; 2; 2. **14.** 16; 16; 24.

Page 98

Aim: To show how to find quotient figures by inspection

Suggestions: In ex. 1 on this page it is evident by the inspection of model examples A and B that the quotient is 1 because the dividend is only slightly larger than the divisor. In cases like these, time would be wasted in using Rule I to obtain the quotient figure. Similarly, in ex. 2 it is easy to tell when the second quotient figure is 0 because the partial dividend is less than the divisor. Thus we see that inspection is used to find quotient figures only in cases where the quotient figure is 1 or 0.

Key: **3.** 1 R4; 10 R40; 10 R77; 81 R2; 50 R25. **4.** 1 R2; 10 R28; 10 R80; 39 R17; 12 R28. **5.** 1 R6; 10 R60; 10 R70; 50 R50; 41 R35. **6.** 1 R1; 10 R11; 12; 30 R35; 60 R15. **7.** 1 R1; 10 R19; 28; 21 R27; 71 R24. **8.** 1 R5; 11 R3; 13; 40 R10; 61. **9.** 1 R5; 10 R51; 10 R40; 84; 90 R10. **10.** 1 R7; 11 R30; 13; 30 R41; 40 R40.

Page 99

Aim: To review long division with 2-figure divisors where the remainder is expressed as R

Key: **1.** $350 ÷ $25 = 14 (mo.). **2.** 2625¢ ÷ 35¢ = 75 (tickets). **3.** 32 + 2 = 34 (persons), $18.70 ÷ 34 = $.55. **4.** 26; 42; 27; 29 R7. **5.** 10 R39; 27; 78; 42. **6.** 38; 31; 65; 43 R6. **7.** 22 R10; 60 R9; 41 R7; 33. **8.** 33; 62; 86; 43. **9.** 31; 54; 39; 80 R33. **10.** 12 R10; 20 R45; 75 R24; 63. **11.** 21 R5; 12 R20; 50 R8; 40 R8. **12.** $.31; $.25. **13.** $.29; $.35. **14.** 1500¢ ÷ 25¢ = 60 (wk.); more than a year. **15.** 1500¢ ÷ 75¢ = 20 (wk.).

Page 100

Aim: To show how to correct quotient figures when two corrections are necessary

Suggestions: This work is fully explained in ex. 1. One fact should be emphasized at the beginning: when the methods of long division given in this book are used, the number of cases in which it is necessary to correct the quotient figure twice is extremely small, being only $\frac{1}{2}$ of 1% of all possible cases. An interesting note is that when Rule I is used with 2-figure divisors ending in 1 to 5, a double correction of quotient figures is necessary only in certain exercises having divisors of 23, 24, 25, 34, 35, and 45. When any of the other 2-figure divisors coming under Rule I are used, a double correction of quotient figures is never necessary.

Key: **2.** 78 boxes. **3.** 7 R17; 74; 78 R7; 75; 78. **4.** 7 R19; 66 R21; 75; 78 R15; 77. **5.** 7 R31; 77 R22; 78; 57 R17; 77 R15. **6.** 7 R15; 68; 67; 72; 77 R16.

Page 101

Aim: To review division skills taught in this chapter

Key: **1.** $21\frac{4}{41}$; $66\frac{4}{21}$; $51\frac{5}{23}$; $80\frac{7}{65}$. **2.** 28; 27; $53\frac{11}{42}$; $73\frac{5}{42}$. **3.** $15\frac{2}{51}$; 65; $42\frac{7}{34}$; 91. **4.** 13; 87; $80\frac{11}{72}$; 47. **5.** $26\frac{7}{22}$; $32\frac{29}{83}$; 76; $77\frac{33}{35}$. **6.** 12; $45\frac{4}{33}$; $29\frac{9}{62}$; $66\frac{11}{25}$. **7.** $21\frac{7}{33}$; $32\frac{23}{44}$; 56; 75. **8.** 27; $45\frac{13}{92}$; 27; $46\frac{5}{54}$. **9.** $20\frac{5}{31}$; $51\frac{7}{64}$; 76; 58. **10.** 73 qt.

11. 45 qt. **12.** 12 hr. **13.** \$.83. **14.** $16\frac{11}{30}$, $23\frac{23}{30}$, $54\frac{7}{30}$, $47\frac{7}{30}$, $43\frac{7}{30}$, $65\frac{13}{30}$; $21\frac{8}{23}$, 31, $70\frac{17}{23}$, $61\frac{14}{23}$, $56\frac{9}{23}$, $85\frac{8}{23}$; $14\frac{1}{35}$, $20\frac{13}{35}$, $46\frac{17}{35}$, $40\frac{17}{35}$, $37\frac{2}{35}$, $56\frac{3}{35}$. **15.** $5\frac{19}{30}$, $11\frac{29}{30}$, $51\frac{13}{30}$, $64\frac{23}{30}$, $43\frac{13}{30}$, $60\frac{7}{30}$; $7\frac{8}{23}$, $15\frac{14}{23}$, $67\frac{2}{23}$, $84\frac{11}{23}$, $56\frac{15}{23}$, $78\frac{13}{23}$; $4\frac{29}{35}$, $10\frac{9}{35}$, $44\frac{3}{35}$, $55\frac{18}{35}$, $37\frac{8}{35}$, $51\frac{22}{35}$. **16.** $16\frac{29}{30}$, $4\frac{23}{30}$, $43\frac{29}{30}$, $37\frac{19}{30}$, $36\frac{29}{30}$, $52\frac{19}{30}$; $22\frac{3}{23}$, $6\frac{5}{23}$, $57\frac{8}{23}$, $49\frac{2}{23}$, $48\frac{5}{23}$, $68\frac{15}{23}$; $14\frac{19}{35}$, $4\frac{3}{35}$, $37\frac{24}{35}$, $32\frac{9}{35}$, $31\frac{24}{35}$, $45\frac{4}{35}$. **17.** $5\frac{23}{30}$, $6\frac{19}{30}$, $55\frac{1}{30}$, $42\frac{1}{30}$, $61\frac{17}{30}$, $48\frac{11}{30}$; $7\frac{8}{23}$, $8\frac{15}{23}$, $71\frac{18}{23}$, $54\frac{19}{23}$, $80\frac{7}{23}$, $63\frac{2}{23}$; $4\frac{33}{35}$, $5\frac{24}{35}$, $47\frac{6}{35}$, $36\frac{1}{35}$, $52\frac{27}{35}$, $41\frac{16}{35}$. **18.** $26\frac{29}{30}$, $21\frac{1}{30}$, $42\frac{13}{30}$, $52\frac{1}{30}$, $44\frac{29}{30}$, $64\frac{7}{30}$; $35\frac{4}{23}$, $27\frac{10}{23}$, $55\frac{8}{23}$, $67\frac{20}{23}$, $58\frac{15}{23}$, $83\frac{18}{23}$; $23\frac{4}{35}$, $18\frac{1}{35}$, $36\frac{13}{35}$, $44\frac{21}{35}$, $38\frac{19}{35}$, $55\frac{2}{35}$.

Page 102

Aim: To review two-step problems

Key: **1.** How many candy bars did Ann have? $6 \times 24 = 144$ (candy bars); $144 \times 6¢ = 864¢$, or \$8.64. **2.** How much did Mary and Bill spend? \$7.75 + \$5.29 + \$.52 = \$13.56; \$13.56 ÷ 2 = \$6.78. **3.** How much did our class make on the Christmas cards? 432 × \$.02 = \$8.64; \$12.50 − \$8.64 = \$3.86 (amount needed). **4.** How many hours are there from 8:30 A.M. to 10:30 A.M.? 2 hr.; $2 \times 8 = 16$ (mi.). **5.** How much does the club make on each pound of nuts? \$1.10 − \$.75 = \$.35; 50 × \$.35 = \$17.50. **6.** How much money did Dick earn last week? 15 × \$.65 = \$9.75; $\frac{1}{3}$ × \$9.75 = \$3.25. **7.** How much did Dick put in the bank that week? $\frac{1}{3}$ × \$17.55 = \$5.85; \$5.85 − \$3.25 = \$2.60. **8.** What is $\frac{1}{4}$ of \$13.64? $\frac{1}{4}$ × \$13.64 = \$3.41; \$5.00 − \$3.41 = \$1.59.

Page 103

Aim: To give a timed test

Suggestion: See this Guide for instructions connected with page 71.

Key: **1.** 331; 308; 300; 371; 347; 382; 365; 348. **2.** 732; 1710; 2609; 2018; 2562. **3.** 1607; 244; 3919; 1576; 1108. **4.** 118,826; 54,625; 160,940; 640,725; 341,796. **5.** 486; 265 R1; 637; 198 R4. **6.** 548; 706; 294; 370 R5.

Page 104

Aim: To present the multiplication facts for the 11's and 12's

Suggestions: It is very convenient to know the multiples of 11 and 12 when you work long-division exercises having 11 and 12 as divisors. Ex. 6, 8, 9, and 10 on this page give reasons why it is desirable to memorize the 12's multiplication facts.

Key: **2.** $4 \times 11 = 44$ (players). **3.** $5 \times 11 = 55$ (mi.). **4.** $2 \times 11 = 22$ (blocks). **8.** $6 \times 12 = 72$ (eggs). **9.** 12 × \$5 = \$60. **10.** 12; 5 min.; 5 min.; $12 \times 5 = 60$ (min.).

Page 105

Aim: To give practice on division with the divisors 11 and 12

Suggestion: The multiplication facts for the 11's and 12's, learned on page 104, are used in practice in the exercises on page 105.

Key: **1.** 4; 6; 6; 3. **2.** 2; 5; 8; 1. **3.** 5; 9; 9; 7. **5.** \$3.19 ÷ 11 = \$.29. **6.** $380 - 8 = 372$ (eggs); $372 \div 12 = 31$ (doz.). **7.** 53; 76; 65; 86; 50; 23. **8.** 73;

45 R2; 56 R4; 22; 34 R5; 80 R9. **9.** 18 R2; 74 R1; 52 R4; 84; 24 R4; 32. **10.** 83; 71; 34; 45; 29; 80 R5. **11.** 54 R7; 28; 64 R11; 75 R5; 53; 31. **12.** 50 R7; 35 R5; 13; 57; 47 R1; 67 R5. **13.** 33; 82; 48; 56; 37; 73.

Page 106

Aim: To review the major aims of Chapter 3

Suggestion: This page reviews eight of the nine major aims listed in this Guide at the beginning of Chapter 3. These are:

Chapter Review	*Aim Number*
Ex. 1 and 3	1
Ex. 2 and 5	7
Ex. 4, 6–12	8 and 9
Ex. 13–20	2, 3, 4, 5

Key: **1.** 210 mi. ÷ 5 = 42 mi. **2.** 2 bu. = 2 × 32 qt. = 64 qt.; 64 × \$.12 = \$7.68. **3.** \$1.75 + \$1.69 = \$3.44; \$5.00 − \$3.44 = \$1.56. **4.** 360 ÷ 12 = 30 (doz.). **5.** (1) 2 pk.; (2) 1 pk. **6.** (1) 7 yr.; (2) 9 yr.; (3) 15 yr. **7.** (1) 29 doz.; (2) 16 doz. **8.** 66; 84; 4; 8. **9.** 48; 55; 3; 6. **10.** 99; 60; 5; 2. **11.** 96; 108; 7; 2. **12.** 72; 88; 7; 3. **13.** 48; 46 R7; 25; 66 R26. **14.** 23; 23 R7; 89; 63. **15.** 23; 43; 77; 44. **16.** 28; 50 R10; 54; 57 R17. **17.** 7 R19; 42 R7; 99 R8; 50 R53. **18.** 74; 55 R15; 61 R5; 86. **19.** 13; 31 R5; 78 R13; 75. **20.** 7 R32; 79; 33; 47.

Page 107

Aim: To give Problem Test 3

Suggestion: See instructions in this Guide for page 43.

Workbook Reference: Arithmetic Workshop, Book 5, page 46

Key: **1.** 3 × 328 mi. = 984 mi. **2.** 3 × \$.59 = \$1.77; \$2.00 − \$1.77 = \$.23. **3.** 6 × \$.55 = \$3.30 (cost of 1 clown suit); 12 × \$3.30 = \$39.60 (cost of 12 clown suits). **4.** From 8 A.M. to 1 P.M. is 5 hr., 5 × 42 mi. = 210 mi. **5.** 1870 ÷ 22 = 85 (sandwiches). **6.** 4 ÷ 3 = $\frac{4}{3}$ (hr.), or $1\frac{1}{3}$ (hr.). **7.** 6 ft. = 72 in.; 72 in. + 2 in. = 74 in.; 74 in. − 56 in. = 18 in. **8.** 3 × \$21.50 = \$64.50; \$64.50 + \$15.00 = \$79.50. **9.** \$79.50 − \$51.02 = \$28.48; \$28.48 ÷ 32 = \$.89. **10.** 53° + 46° + 45° + 42° + 49° = 235°; 235° ÷ 5 = 47°.

Page 108

Aim: To provide a diagnostic test with page references for review work

Workbook Reference: Arithmetic Workshop, Book 5, page 50

Key: **1.** 110,682; 91,460; 133,433; 329,220. **2.** 602,872; 259,284; 794,085; 278,944. **3.** 71,955; 98,754; 101,380; 182,400. **4.** 3; 1 R19; 4; 2 R12. **5.** 9; 8 R7; 7 R11; 9 R13. **6.** 9 R8; 6; 4; 6. **7.** 42; 43; 32 R5; 53. **8.** \$.22; \$.25; \$.64 R3¢; \$.37. **9.** 7 R9; 7; 3 R34; 7 R41. **10.** 19 R2; 48; 37 R26; 59 R11. **11.** 1 R4; 10 R29; 60 R5; 81. **12.** 77 R21; 77 R25; 75 R22; 64. **13.** 43; 57 R8; 68; 79. **14.** 69; 82; 67; 45 R7.

Chapter 4

Aims of Chapter 4. The major aims of Chapter 4 are to:

1. Review the fundamental skills taught in the previous chapters.
2. Reteach the meaning of fractions and teach the arithmetic words *numerator*, *denominator*, and *terms*.
3. Reteach addition of fractions with like denominators when the sum is less than or greater than 1.
4. Teach changing fractions to lowest terms.
5. Teach the meaning of an improper fraction and how to change it to a mixed number.
6. Teach addition of mixed numbers with like denominators.
7. Teach the subtraction of fractions and mixed numbers with like denominators.
8. Determine the common uses of fractions.

Page 109

Aim: To present problems dealing with the care of pets

Suggestions: Children love to care for and talk about their pets. Encourage pupils to discuss their personal experiences with pets. This discussion will motivate an interest in solving the problems on page 109. Some children will suggest additional problems which may be solved by the class.

Key: **1.** 1 + 2 + 5 + 2 + 4 + 15 + 10 = 39 (pets). **2.** 9 × $.35 = $3.15; $3.15 + $.59 = $3.74. **3.** $7.50 − $3.74 = $3.76. **4.** 283 ÷ 12 = 23 (doz.), 7 eggs over. **5.** 22 × $.62 = $13.64. **6.** $13.64 − $6.25 = $7.39.

Page 110

Aim: To provide a rapid review of basic skills

Suggestions: Pupils should be urged to:

1. Estimate answers before starting the computation.
2. Complete as many examples as possible by mental arithmetic, such as in ex. 8, parts 2 and 3; ex. 9 and 10; ex. 11, part 1; and so on.

Workbook Reference: Arithmetic Workshop, Book 5, page 58

Key: **1.** (1) 12 doz.; (2) 16 doz. **2.** (1) 2 da.; (2) 5 da.; (3) 7 da. **3.** 1110 ÷ 30 = 37 (gal.). **4.** 1952 − 1948 = 4 (yr.). **5.** $\frac{1}{4}$ × $1.20 = $.30; $\frac{3}{4}$ × $1.20 = $.90; $1.00 − $.90 = $.10. **6.** 1185 ÷ 5 = 237 (children). **7.** 500 × 5¢ = 2500¢, or $25.00; $25.00 − $11.50 = $13.50. **8.** 6298; 31; 23. **9.** 132; 148; 20. **10.** 53; 582; 20. **11.** 93; 35,420; 167,552. **12.** 11,920; 1313; 7828. **13.** 18; 64; 244,881. **14.** 98; 3657; 541,260. **15.** 13; 4405; 1777. **16.** 124; 3305; 91. **17.** 4100; 113,582; 233. **18.** 288; 83 R7; 147.

Page 111

Aim: To introduce new words and meanings in the study of fractions

Suggestions: This page gives a further study of the meaning of fractions, including the meanings of the words *numerator*, *denominator*, and *terms* of a fraction. The pupils should become thoroughly acquainted with these words since they are used constantly in the work on fractions.

Before taking up the study of the addition and subtraction of fractions, you will find it helpful to read a brief discussion of the nature of the work on fractions as taught in our schools today.

The Modern Teaching of Fractions. The teaching of common fractions in our elementary schools has undergone more changes in the past forty years than has any other topic. Forty years ago children were expected to change to lowest terms, and to add and subtract, fractions with large numerators and denominators. To do such work successfully, the child had to become acquainted with elaborate methods of finding greatest common divisors and least common multiples. Today children are no longer expected to perform operations on such bulky fractions, since work of this kind is not required in everyday life. Consequently, the great majority of the fractions taught today have denominators not greater than 16. In the addition of such fractions, common denominators are usually found by simple inspection, thus avoiding the necessity of teaching the topic of least common multiples. In fact, terms like *greatest common divisor* and *least common multiple* are rarely used today in our elementary schools.

The reason for the decreasing popularity of the bulky common fraction is easily explained. Up to fifty years ago in this country, very few measurements were made with instruments in which the unit of measure was divided decimally; hence, in those days parts of a unit had to be expressed as common fractions, these fractions sometimes having large denominators. Today many of our measuring instruments are made with decimal scales, parts of a unit being expressed as tenths, hundredths, thousandths, or even millionths of a unit. As examples of this modern practice, the mile is now measured in tenths on the speedometer of a car; the pound is divided into tenths on school scales; the inch and the foot are divided into tenths, hundredths, and thousandths on the instruments used by engineers and surveyors; the second is divided into tenths on stop watches; and the degree is divided into tenths on clinical thermometers. Every one of these new uses for decimals makes one less use for common fractions. Thus common fractions with large numerators and denominators have gradually been replaced by decimals. This displacement leaves only simple common fractions to be handled by the methods of common fractions. The effect of this change on the teaching of common fractions is that modern courses of study are now prescribing a more simplified treatment of this topic, similar to the one given in *American Arithmetics.*

Key: **1.** $\frac{1}{6}$, $\frac{5}{6}$, $\frac{5}{6}$. **5.** $\frac{3}{4}$, $\frac{5}{8}$, $\frac{1}{4}$, $\frac{3}{10}$. **6.** $\frac{1}{4}$, $\frac{3}{8}$, $\frac{3}{4}$, $\frac{7}{10}$. **7.** 16, $\frac{6}{16}$. **8.** 5 numerator, 8 denominator; 1 numerator, 3 denominator; 4 numerator, 5 denominator; 9 numerator, 10 denominator; 11 numerator, 16 denominator; 15 numerator, 16 denominator. **9.** $\frac{7}{12}$.

Pages 112–113

Aim: To teach addition of fractions having like denominators in which the sum of the fractions is less than or equal to 1 and cannot be changed

Suggestions: On page 112 bring out the fact that only things having the *same name* can be added. Thus, we can add 1 pencil and 2 pencils; but we cannot add 1 pencil and 2 chairs. Also make clear that every fraction has a name that is indicated by its *denominator*. Hence, only fractions having the same name, or the same denominator, can be added. Thus, 1 *fifth* and 2 *fifths* can be added, just as 1 *ball* and 2 *balls* can be added.

Key: Page 112 **1.** A: 12, B: 16, C: 3, D: 2. **2.** Green: A: $\frac{5}{12}$, B: $\frac{7}{16}$, C: $\frac{2}{3}$, D: $\frac{1}{2}$. White: A: $\frac{7}{12}$, B: $\frac{9}{16}$, C: $\frac{1}{3}$, D: $\frac{1}{2}$. **4.** Green: E: $\frac{3}{8}$, F: $\frac{2}{5}$, G: $\frac{1}{4}$, H: $\frac{3}{10}$. White: E: $\frac{5}{8}$, F: $\frac{3}{5}$, G: $\frac{3}{4}$, H: $\frac{7}{10}$. **7.** F. **8.** D. **9.** B. **10.** H. **11.** A.

Page 113 **1.** 2 thirds, 4 fifths, 7 tenths, 9 sixteenths. **5.** $\frac{4}{5}$; $\frac{2}{3}$; $\frac{3}{4}$; $\frac{2}{5}$; $\frac{5}{6}$; $\frac{9}{10}$; $\frac{9}{16}$; $\frac{7}{12}$. **6.** $\frac{7}{8}$; $\frac{7}{8}$; $\frac{4}{5}$; $\frac{5}{8}$; $\frac{4}{7}$; $\frac{5}{12}$; $\frac{7}{10}$; $\frac{9}{16}$.

Pages 114–115

Aims: To present equal fractions and to show how to change a fraction

Suggestions: Page 114 shows by the aid of diagrams that $\frac{1}{2} = \frac{2}{4}$, which is another way of saying that $\frac{1}{2}$ and $\frac{2}{4}$ are equal fractions. Equal fractions have the same value, just as 2 nickels and 1 dime have the same value. When you have two equal fractions, you can replace one of them by the other fraction just as you can replace a dime by two nickels. Page 114 shows also that $\frac{2}{8} = \frac{1}{4}$, $\frac{3}{4} = \frac{6}{8}$, and so on. Instead of using blackboard diagrams to illustrate equal fractions, you may find it more meaningful to use paper plates and cut them into parts. This procedure makes it possible to show that $\frac{2}{4}$ is the same as $\frac{1}{2}$, that $\frac{4}{8}$ is the same as $\frac{1}{2}$, and so on. The concept that two fractions can be equal is so important that it justifies all the time that may be necessary to show this fact experimentally.

On page 115 the pupils learn how to change a fraction like $\frac{2}{4}$ to another fraction that is equal to it by dividing both terms of $\frac{2}{4}$ by 2; hence, they see that $\frac{2}{4} = \frac{1}{2}$. It is often convenient to change a fraction like $\frac{1}{2}$ to $\frac{2}{4}$, just as it is convenient to change a dime to two nickels. A very important principle is stated in the box below ex. 3. The principle is as follows: *If you divide both terms of a fraction by the same number, you get another fraction having the same value.* This principle shows how to change fractions to lowest terms. It will be used frequently in other situations later on. Pupils should be made conscious of the use of this principle. For example, if the pupil states that $\frac{12}{16} = \frac{3}{4}$, he should be able to explain that he obtained $\frac{3}{4}$ by dividing both terms of $\frac{12}{16}$ by 4. The corresponding principle that you can multiply both terms of a fraction by the same number, and thus get another fraction having the same value, is not taken up until page 186 of the text because the new principle is not used until that time.

Workbook Reference: Arithmetic Workshop, Book 5, pages 33 and 35

Key: Page 114 **1.** 2, 2, Yes. **2.** 2, Yes, 2, Yes, Yes. **3.** 6, 3, Yes, Yes. **4.** Right, right, right, right, wrong, right; wrong, right, right, wrong, right, right.

Page 115 **3.** $\frac{1}{2}$, Yes. **5.** Divide both terms by 6 to get $\frac{1}{2}$. **6.** $\frac{1}{2}$; $\frac{2}{3}$; $\frac{1}{4}$; $\frac{3}{8}$; $\frac{1}{4}$; $\frac{5}{6}$; $\frac{1}{2}$; $\frac{7}{8}$. **7.** $\frac{1}{2}$; $\frac{2}{3}$; $\frac{1}{2}$; $\frac{3}{4}$; $\frac{1}{2}$; $\frac{5}{8}$; $\frac{2}{3}$; $\frac{2}{5}$. **8.** $\frac{3}{4}$; $\frac{1}{3}$; $\frac{1}{3}$; $\frac{1}{6}$; $\frac{1}{2}$; $\frac{1}{3}$; $\frac{3}{5}$; $\frac{3}{4}$.

Pages 116–117

Aim: To extend addition of fractions with like denominators to cases in which the fraction in the sum requires changing to lowest terms

Suggestion: Here the fraction in the sum, which has to be changed to lowest terms, is always smaller than 1. On page 117 the idea of whole versus mixed numbers arises. A mixed number is a combination of a whole number and a fraction. Pupils should be instructed that the fraction parts of numbers should be added first, then the whole numbers.

Workbook Reference: Arithmetic Workshop, Book 5, pages 32 and 41

Key: Page 116 **2.** $\frac{3}{8}$ mi. + $\frac{3}{8}$ mi. = $\frac{6}{8}$ mi., or $\frac{3}{4}$ mi. **3.** $\frac{3}{8}$ yd. + $\frac{1}{8}$ yd. = $\frac{4}{8}$ yd., or $\frac{1}{2}$ yd. **4.** $\frac{9}{16}$ lb. + $\frac{5}{16}$ lb. = $\frac{14}{16}$ lb., or $\frac{7}{8}$ lb. **5.** $\frac{1}{3}$; $\frac{1}{2}$; $\frac{2}{3}$; $\frac{2}{3}$; $\frac{1}{5}$; $\frac{4}{5}$; $\frac{2}{3}$; $\frac{1}{2}$. **6.** $\frac{4}{5}$; $\frac{1}{2}$; $\frac{1}{2}$; $\frac{4}{7}$; $\frac{1}{6}$; $\frac{1}{2}$; $\frac{2}{5}$; $\frac{7}{8}$. **7.** $\frac{4}{5}$; $\frac{1}{4}$; $\frac{6}{7}$; $\frac{1}{3}$; $\frac{3}{8}$; $\frac{5}{8}$; $\frac{5}{8}$; $\frac{3}{5}$. **8.** $\frac{2}{3}$; $\frac{3}{5}$; $\frac{3}{4}$; $\frac{7}{12}$. **9.** $\frac{5}{6}$; $\frac{5}{8}$; $\frac{2}{5}$; $\frac{7}{10}$. **10.** $\frac{4}{5}$; $\frac{5}{6}$; $\frac{3}{4}$; $\frac{1}{2}$.

Page 117 **2.** $1\frac{3}{8}$ yd. + $1\frac{3}{8}$ yd. = $2\frac{6}{8}$ yd., or $2\frac{3}{4}$ yd. **3.** $7\frac{2}{3}$; $7\frac{1}{4}$; $8\frac{3}{4}$; $7\frac{1}{3}$; $4\frac{3}{8}$; $6\frac{4}{5}$; $2\frac{3}{8}$; $5\frac{2}{5}$. **4.** $2\frac{1}{2}$; $6\frac{3}{4}$; $5\frac{2}{3}$; $1\frac{3}{5}$; $3\frac{5}{8}$; $2\frac{3}{5}$; $1\frac{1}{2}$; $6\frac{1}{2}$.

Page 118

Aim: To provide a review of addition, subtraction, multiplication, division, and averages

Workbook Reference: Arithmetic Workshop, Book 5, page 38

Key: **1.** 79 + 118 + 56 + 82 + 104 + 95 = 534; 534 ÷ 6 = 89. **2.** $31.61. **3.** 73. **4.** 230,625; 91,312. **5.** 35; 53; 67; 44 R25. **6.** 75 R14; 32 R7; 68 R17; 53 R13. **7.** 42; 62 R5; 34; 46. **8.** 42; 75 R7; 32 R2; 76 R17. **9.** 2548; 1244; 159. **10.** 2299; 7376; 3996. **11.** 780; 3976; 2237. **12.** 1385; 1656; 838. **13.** 6174; 269,280; 488,565; 41,184. **14.** 2088; 84,626; 87,162; 104,829. **15.** 2408; 62,208; 258,445; 174,038. **16.** 1826; 1700. **17.** 1221; 2817. **18.** 2582; 2353. **19.** 2008; 2332.

Pages 119–120

Aim: To introduce the subtraction of fractions with like denominators where the fraction in the minuend is larger than the fraction in the subtrahend

Suggestions: As in the addition of fractions, emphasis should be placed on the fact that fractions must have the same name, or denominator, before they can be subtracted. In the subtraction of fractions, the answers frequently need to be changed to lowest terms; hence, the pupils should be cautioned to change them.

Key: Page 119 **2.** $\frac{1}{4}$ yd. **3.** $\frac{1}{4}$ lb. **4.** $\frac{1}{2}$; $\frac{2}{5}$; $\frac{2}{3}$; $\frac{5}{8}$; $\frac{3}{8}$; $\frac{5}{6}$; $\frac{1}{5}$; $\frac{5}{8}$; $\frac{3}{5}$. **5.** $\frac{1}{3}$; $\frac{3}{4}$; $\frac{2}{5}$; $\frac{1}{2}$; $\frac{1}{5}$; $\frac{3}{5}$; $\frac{2}{3}$; $\frac{1}{4}$; $\frac{1}{2}$.

Page 120 **4.** $3\frac{1}{2}$; 5; $1\frac{1}{4}$; $1\frac{3}{4}$; $1\frac{1}{6}$; $2\frac{3}{5}$; $1\frac{1}{2}$; $\frac{1}{2}$. **5.** $1\frac{3}{5}$; $\frac{2}{3}$; $6\frac{3}{4}$; $1\frac{1}{5}$; $\frac{5}{6}$; $4\frac{1}{4}$; $5\frac{3}{10}$; $6\frac{1}{2}$. **6.** 7; $2\frac{3}{5}$; 3; $1\frac{3}{8}$; 2; $1\frac{1}{4}$; $2\frac{1}{3}$; 4. **7.** $\frac{1}{2}$; $2\frac{7}{8}$; $3\frac{1}{3}$; $3\frac{4}{5}$; $6\frac{1}{8}$; $2\frac{2}{5}$; $\frac{1}{3}$; 4. **8.** $5\frac{7}{8}$ yd. − $2\frac{3}{8}$ yd. = $3\frac{1}{2}$ yd.

Page 121

Aim: To present problems surrounding the home and the school

Suggestion: Six of the problems on this page involve money. This type is the most common problem-solving situation encountered by adults; and *American Arithmetic, Grade 5* includes many such problems.

Key: **1.** $41 + 46 + 45 + 44 + 39 = 215$ (children), $215 \div 5 = 43$ (children). **2.** $\$25.00 - \$19.95 = \$5.05$. **3.** $\$29.40 = 2940¢$, $2940¢ \div 35¢ = 84$ (tickets). **4.** $216 - 7 = 209$ (oranges), $209 \times \$.05 = \$10.45$. **5.** (1) 1 bu. = 32 qt., 4×32 qt. = 128 qt.; (2) $128 \times \$.12 = \$15.36$. **6.** $45 + 40 + 55 + 45 + 55 = 240$ (min.), $240 \div 60 = 4$ (hr.). **7.** $1956 - 1892 = 64$ (yr.); 64 yr. = 3 score and 4 years. **8.** 8 quarters = \$2.00, 12 dimes = \$1.20, 17 nickels = \$.85, $\$2.00 + \$1.20 + \$.85 + \$.38 = \$4.43$. **9.** \$2.77. **10.** $6\frac{7}{8}$ yd. $-$ $3\frac{5}{8}$ yd. = $3\frac{1}{4}$ yd.

Pages 122–123

Aims: To teach the meaning of an improper fraction and to show how such fractions can be changed to whole or mixed numbers

Suggestions: This work on improper fractions prepares for the addition of fractions in which the fraction in the sum is an improper fraction. The terms *proper fraction* and *improper fraction* should be thoroughly understood by the pupils. In the work in ex. 1–3 on page 122, paper plates cut into parts may be used in place of circles if you desire. On page 123 show the pupil how he can change an improper fraction to a whole number or a mixed number by dividing its numerator by its denominator. This work is explained in ex. 2.

Key: Page 122 **4.** Yes. **7.** Proper fractions: $\frac{5}{6}$, $\frac{2}{3}$, $\frac{5}{12}$, $\frac{13}{16}$; improper fractions: $\frac{9}{8}$, $\frac{4}{4}$, $\frac{6}{6}$, $\frac{15}{12}$, $\frac{16}{16}$.

Page 123 **1.** Proper fractions: $\frac{7}{8}$, $\frac{1}{6}$, $\frac{11}{12}$, $\frac{5}{16}$; improper fractions: $\frac{9}{9}$, $\frac{9}{5}$, $\frac{5}{5}$, $\frac{17}{10}$, $\frac{16}{16}$. **7.** $2\frac{1}{2}$; $1\frac{2}{3}$; $3\frac{1}{2}$; $1\frac{1}{5}$; $1\frac{1}{3}$; 1; $1\frac{1}{3}$; $3\frac{2}{3}$; 1.

Page 124

Aim: To extend addition of fractions with like denominators to examples wherein the sum is an improper fraction

Suggestions: The model example illustrates the process to be used. After the improper fraction has been changed to a mixed number, the fractional part of the number is changed to lowest terms. Notice that in the model example the sum is written:

$$\frac{12}{8} = 1\frac{4}{8} \text{ or } 1\frac{1}{2}$$

Be sure that the pupils follow the same procedure in the examples in 5 and 6.

Key: **2.** 1 mi.; 1. **3.** $\frac{1}{2}$ mi. + $\frac{1}{2}$ mi. = 1 mi. **4.** $\frac{5}{8}$ mi. + $\frac{5}{8}$ mi. = $\frac{10}{8}$ mi. = $1\frac{2}{8}$ mi., or $1\frac{1}{4}$ mi. **5.** $1\frac{1}{2}$; $1\frac{2}{5}$; $1\frac{2}{3}$; 1; 1; $1\frac{3}{8}$; $1\frac{1}{3}$; $1\frac{1}{5}$. **6.** $1\frac{1}{4}$; 1; 1; 1; $1\frac{1}{4}$; $1\frac{4}{5}$; $1\frac{1}{8}$; 1.

Pages 125–126

Aim: To apply to mixed numbers the skill taught on page 124

Suggestion: Study carefully the model examples in ex. 1. They represent three different types of addition examples. Answers must be changed to lowest terms to be correct. This skill requires firm discipline in calculation. Above-average pupils will readily master it.

Workbook Reference: Arithmetic Workshop, Book 5, pages 32 and 35

Key: Page 125 **2.** $1\frac{3}{4}$ hr. + $1\frac{1}{4}$ hr. = $2\frac{4}{4}$ hr., or 3 hr. **3.** $4\frac{3}{8} + 1\frac{7}{8} = 5\frac{10}{8} = 5 + 1\frac{2}{8} = 6\frac{2}{8} = 6\frac{1}{4}$ (lb.). **4.** $2\frac{3}{4} + \frac{3}{4} = 2\frac{6}{4} = 2 + 1\frac{2}{4} = 3\frac{1}{2}$ (hr.). **5.** $1\frac{2}{3} + 1\frac{1}{3} = 2\frac{3}{3} = 2 + 1$, or 3 (cups). **6.** $2\frac{1}{4} + 2\frac{3}{4} = 4\frac{4}{4} = 4 + 1$, or 5 (cups). **7.** $2\frac{3}{4} + 2\frac{3}{4} = 4\frac{6}{4} = 4 + 1\frac{2}{4} = 5\frac{2}{4} = 5\frac{1}{2}$ (mi.). **8.** $4\frac{1}{4}$; $8\frac{1}{3}$; $6\frac{1}{5}$; 10; $7\frac{1}{5}$; 11; $10\frac{1}{4}$. **9.** $8\frac{1}{2}$; $11\frac{3}{4}$; 13; 9; $9\frac{1}{2}$; $14\frac{3}{8}$; $5\frac{4}{5}$. **10.** $6\frac{2}{3}$; 10; 3; 7; $10\frac{2}{5}$; $8\frac{1}{6}$; $7\frac{7}{8}$.

Page 126 **1.** $2\frac{1}{2}$ lb. + $\frac{1}{2}$ lb. = 3 lb. **2.** $78\frac{3}{4}$ lb. − $3\frac{1}{4}$ lb. = $75\frac{1}{2}$ lb. **3.** $2\frac{3}{4}$ yd. + $3\frac{3}{4}$ yd. = $6\frac{1}{2}$ yd. **4.** $2\frac{1}{8}$; $2\frac{4}{5}$; $3\frac{3}{4}$; $2\frac{1}{3}$; $6\frac{1}{4}$; $3\frac{3}{8}$. **5.** $7\frac{1}{4}$; $10\frac{1}{3}$; 9; 6. **6.** 4; $6\frac{1}{4}$; 10; 5. **7.** $4\frac{1}{2}$; $15\frac{2}{5}$; $8\frac{1}{2}$; 13; 13; $10\frac{1}{3}$; $10\frac{2}{5}$. **8.** 8; $14\frac{2}{3}$; 12; $10\frac{2}{3}$; 9; $8\frac{5}{8}$; 5. **9.** $1\frac{1}{4}$, $2\frac{1}{5}$, 3, $2\frac{4}{5}$, $4\frac{3}{8}$, $1\frac{1}{2}$, $4\frac{1}{5}$; $1\frac{1}{5}$, 5, $5\frac{3}{4}$, $8\frac{1}{2}$, $4\frac{2}{5}$, $2\frac{1}{2}$, $\frac{5}{6}$. **10.** $5\frac{1}{2}$ lb. + $3\frac{1}{2}$ lb. = 9 lb. **11.** $63\frac{1}{2}$ in. − 62 in. = $1\frac{1}{2}$ in. **12.** $5\frac{3}{8}$ lb. − $4\frac{1}{8}$ lb. = $1\frac{1}{4}$ lb.

Page 127

Aim: To provide further practice in subtracting fractions with like denominators

Suggestion: The work on this page extends the examples completed on page 120. Stress the fact that answers must be changed to lowest terms.

Workbook Reference: Arithmetic Workshop, Book 5, pages 36 and 37

Key: **1.** $\frac{1}{4}$; $\frac{3}{5}$; $\frac{1}{4}$; $\frac{1}{5}$; $\frac{1}{8}$. **2.** $\frac{1}{3}$; $\frac{4}{7}$; $\frac{1}{2}$; $\frac{1}{6}$; $\frac{1}{2}$. **3.** 0; $\frac{2}{3}$; $\frac{1}{5}$; $\frac{1}{8}$; $\frac{1}{5}$. **4.** $7\frac{7}{10}$ sec. − $7\frac{3}{10}$ sec. = $\frac{2}{5}$ sec. **5.** $3\frac{3}{4}$ yd. − $3\frac{1}{4}$ yd. = $\frac{1}{2}$ yd. **6.** $4\frac{3}{4}$ hr. + $\frac{3}{4}$ hr. = $5\frac{1}{2}$ hr. **7.** $3\frac{1}{4}$; $2\frac{1}{3}$; $5\frac{2}{5}$; $\frac{2}{5}$; $3\frac{3}{8}$; $3\frac{1}{3}$; $7\frac{7}{16}$. **8.** $1\frac{1}{3}$; $6\frac{1}{2}$; 3; $5\frac{1}{2}$; $1\frac{1}{3}$; $2\frac{1}{4}$; 1. **9.** $4\frac{1}{2}$; $\frac{3}{5}$; 3; $\frac{1}{2}$; $1\frac{4}{5}$; $6\frac{5}{6}$; $1\frac{7}{8}$. **10.** $5\frac{1}{4}$; $1\frac{5}{6}$; $1\frac{3}{5}$; 2; $\frac{1}{4}$; $2\frac{1}{5}$; $2\frac{1}{2}$. **11.** $2\frac{7}{8}$ yd. − $1\frac{3}{8}$ yd. = $1\frac{1}{2}$ yd. **12.** $4\frac{3}{4}$ hr. − $2\frac{1}{4}$ hr. = $2\frac{1}{2}$ hr.

Pages 128–129

Aim: To give experience in everyday uses of fractions

Suggestions: Pupils constantly seek applications for new learnings. The previous pages have developed certain skills in adding fractions with like denominators. The various problem situations described on these pages are a few ways in which adults use fractions. Notice the various settings:

1. In the kitchen
2. At the store
3. With measures of time and distance
4. At work

Pupils may suggest other ways of using fractions after they have completed these problems.

Key: **1.** (1) $2\frac{3}{4} + 2\frac{1}{4} = 5$ (cups of juice); (2) $5 + 5 = 10$ (cups of the drink). **2.** $5\frac{3}{4}$ yd. + $1\frac{3}{4}$ yd. = $7\frac{1}{2}$ yd. **3.** $1\frac{3}{4}$ hr. − $\frac{3}{4}$ hr. = 1 hr. **4.** $2\frac{11}{16}$ lb. + $2\frac{13}{16}$ lb. = $5\frac{1}{2}$ lb. **5.** $2\frac{1}{4}$ mi. + $\frac{3}{4}$ mi. = 3 mi. **6.** $2\frac{3}{4}$ yd. + $1\frac{1}{4}$ yd. = 4 yd.; yes, $\frac{1}{4}$ yd. extra. **7.** $5\frac{7}{10}$ mi. + $4\frac{8}{10}$ mi. = $10\frac{5}{10}$ mi. or $10\frac{1}{2}$ mi. **8.** $\frac{11}{16}$ lb. − $\frac{7}{16}$ lb. = $\frac{1}{4}$ lb. **9.** $2\frac{3}{4}$ hr. − $1\frac{1}{4}$ hr. = $1\frac{1}{2}$ hr. **10.** 5:45 = $5\frac{3}{4}$; $5\frac{3}{4} - 2\frac{3}{4} = 3$, or 3 o'clock. **11.** $1\frac{1}{4}$ hr. + $3\frac{3}{4}$ hr. = 5 hr.; 5 × \$.60 = \$3.00. **12.** $22\frac{7}{8}$ yd. + $15\frac{5}{8}$ yd. = $38\frac{1}{2}$ yd.

Page 130

Aim: To review the addition and subtraction of fractions

Suggestions: The work on this page can be completed *mentally*. Ask each pupil to think out the answer and then write it. If slower pupils need to make use of pencil and paper, allow them to do so.

Workbook Reference: Arithmetic Workshop, Book 5, pages 40 and 42

Key: **1.** $\frac{1}{2}$; $\frac{1}{2}$; $\frac{2}{3}$; $\frac{3}{5}$; $\frac{5}{6}$; $\frac{1}{3}$; $\frac{3}{4}$; $\frac{1}{2}$. **2.** $2\frac{2}{3}$; 1; $2\frac{1}{5}$; $3\frac{1}{2}$; 4; 1; $2\frac{1}{2}$; 3. **4.** $10\frac{3}{4}$ yd. − $2\frac{1}{4}$ yd. = $8\frac{1}{2}$ yd. **5.** $\frac{2}{5}$; $\frac{2}{3}$; 1; 0; 0. **6.** $\frac{1}{4}$; $1\frac{1}{5}$; $\frac{1}{2}$; 1; $\frac{1}{6}$. **7.** 1; $1\frac{1}{4}$; $6\frac{1}{3}$; $7\frac{1}{8}$; $5\frac{2}{5}$; $5\frac{5}{6}$; $7\frac{1}{4}$. **8.** $1\frac{1}{5}$; $1\frac{2}{3}$; $5\frac{3}{4}$; 3; $9\frac{4}{5}$; $3\frac{1}{2}$; $10\frac{1}{2}$. **9.** $\frac{3}{4} + \frac{3}{4} = 1\frac{1}{2}$ (cups). **10.** $\frac{1}{2}$; $\frac{2}{3}$; $2\frac{1}{2}$; $7\frac{1}{4}$; $2\frac{1}{2}$; $2\frac{1}{2}$; $2\frac{3}{8}$. **11.** $\frac{1}{2}$; $\frac{3}{4}$; 6; $3\frac{1}{6}$; $4\frac{3}{5}$; $3\frac{1}{2}$; $3\frac{2}{5}$.

Page 131

Aim: To give a timed test

Suggestion: This is the third timed test in the book. Instructions for giving the first test are found in this Guide for textbook page 71.

Key: **1.** 10,884; 20,296; 16,695; 20,000; 22,134. **2.** 1345; 2299; 1073; 989; 561. **3.** 2904; 1940; 558; 2143; 2997. **4.** 469,026; 106,640; 190,536; 40,385; 149,424; 437,014. **5.** 73; 86; 85; 59 R7. **6.** 72 R11; 49; 39; 64.

Page 132

Aim: To review the major aims of Chapter 4

Suggestion: This page reviews six of the eight major aims listed in this Guide at the beginning of Chapter 4. These are:

Chapter Review	*Aim Number*
Ex. 1	2
Ex. 2	4
Ex. 3	5
Ex. 4–7	6, 7, 8
Ex. 8	2
Ex. 9–11	6
Ex. 12–14	7
Ex. 15	6 and 7

Key: **2.** $\frac{1}{2}$; $\frac{3}{4}$; $\frac{1}{3}$; $\frac{3}{8}$; $\frac{3}{8}$. **3.** $1\frac{3}{4}$; $2\frac{2}{3}$; $2\frac{1}{2}$; $1\frac{1}{2}$; $4\frac{1}{5}$. **4.** $12\frac{8}{10}$ mi. − $10\frac{5}{10}$ mi. = $2\frac{3}{10}$ mi. **5.** $1\frac{1}{4}$ hr. + $1\frac{1}{4}$ hr. = $2\frac{1}{2}$ hr. **6.** $\frac{7}{8}$ mi. − $\frac{5}{8}$ mi. = $\frac{1}{4}$ mi. **7.** $3\frac{1}{2} + 1\frac{1}{2} = 5$ (cups). **9.** $12\frac{3}{5}$; 7; $10\frac{4}{5}$; $14\frac{1}{2}$. **10.** $6\frac{3}{4}$; $4\frac{1}{2}$; 8; $7\frac{5}{6}$. **11.** 8; $11\frac{1}{3}$; $11\frac{1}{4}$; $9\frac{3}{5}$. **12.** $3\frac{2}{3}$; $3\frac{1}{2}$; 6; $3\frac{1}{2}$. **13.** $\frac{3}{5}$; 3; $\frac{1}{2}$; $3\frac{3}{4}$. **14.** $2\frac{3}{8}$; $1\frac{2}{3}$; 2; $1\frac{3}{5}$. **15.** $3\frac{4}{5}$; $1\frac{1}{4}$; $4\frac{1}{5}$; $10\frac{2}{5}$; $2\frac{1}{4}$; $6\frac{1}{4}$; $6\frac{1}{8}$.

Page 133

Aim: To give Problem Test 4

Workbook Reference: Arithmetic Workshop, Book 5, page 67

Key: **1.** $6\frac{3}{4}$ hr. − $5\frac{1}{4}$ hr. = $1\frac{1}{2}$ hr. **2.** 910 ÷ 35 = 26 (hr.). **3.** 25¢ ÷ 3 = $8\frac{1}{3}$¢. **4.** 375 × \$2.95 = \$1106.25. **5.** $2\frac{3}{8}$ yd. + $3\frac{7}{8}$ yd. = $6\frac{1}{4}$ yd. **6.** 5 lb. ÷ 4 = $1\frac{1}{4}$ lb.

7. $125 \div 4 = 31$ (marbles), and 1 marble over. **8.** $85 + 87 + 89 + 91 = 352$; $352 \div 4 = 88$. **9.** (1) $3 \times \$1.69 = \$5.07$; $\$6.00 - \$5.07 = \$.93$; (2) 3 pennies, 1 nickel, 1 dime, 1 quarter, 1 half dollar, or 7 coins. **10.** $272 \div 34 = 8$ (tickets).

Page 134

Aim: To provide a diagnostic test with page references

Key: **1.** $\frac{2}{3}$; $\frac{3}{4}$; $\frac{3}{4}$; $\frac{1}{2}$; $\frac{7}{8}$. **2.** $1\frac{3}{4}$; 1; 2; $3\frac{1}{2}$; $1\frac{2}{3}$. **3.** $\frac{4}{5}$; $\frac{3}{4}$; $\frac{5}{12}$; $\frac{9}{10}$; $\frac{11}{16}$. **4.** $\frac{2}{3}$; $\frac{3}{4}$; $\frac{2}{5}$; $\frac{7}{8}$; $\frac{2}{3}$. **5.** $3\frac{2}{3}$; $7\frac{1}{2}$; $10\frac{1}{4}$; $8\frac{1}{2}$; $10\frac{4}{5}$. **6.** 1; $1\frac{1}{3}$; 1; $1\frac{1}{4}$; $1\frac{1}{2}$. **7.** 9; $14\frac{2}{5}$; $4\frac{5}{6}$; $8\frac{3}{5}$; $3\frac{1}{8}$. **8.** $\frac{3}{4}$; $\frac{3}{5}$; $\frac{3}{5}$; $\frac{3}{8}$; $\frac{1}{3}$. **9.** $1\frac{3}{4}$; 6; $3\frac{3}{8}$; $\frac{4}{5}$; $2\frac{1}{6}$.

Chapter 5

Aims of Chapter 5. The major aims of Chapter 5 are to:

1. Review the fundamental skills taught in previous chapters.
2. Reteach place value to hundred thousands and extend to hundred millions.
3. Extend the teaching of Roman numerals to include writing the current year.
4. Reteach meaning and importance of zero.
5. Reteach rounding off of numbers and estimating answers.
6. Teach long division with 2-figure divisors ending in 6, 7, 8, 9 with no correction.
7. Teach long division with 2-figure divisors ending in 6, 7, 8, 9 with one correction.
8. Teach long division with 2-figure divisors ending in 6, 7, 8, 9 with two corrections.
9. Reteach zeros and 9's in the quotient.
10. Teach long division with 2-figure divisors of 13–19 inclusive.

Pages 135–136

Aim: To present problems dealing with nature lore

Suggestions: Arithmetic is all around us. On these pages the pupils discover some of the arithmetic which can be found in the insect world. Page 135 discusses the cicada, a curious kind of insect. If a pupil can find a picture of a cicada, it would arouse interest in solving these problems; and a research project on the life of the cicada would make an interesting science activity as well as enrich the problems on page 135. Page 136 discusses insects common in our country, such as the cricket, the ant cow, and the queen bee. Some pupils may have had interesting experiences in the raising of bees and will want to tell them. Also, audio-visual aids on this subject are available. Many teachers correlate these pages with a science lesson.

Workbook Reference: Arithmetic Workshop, Book 5, page 115

Key: Page 135 **1.** (1) 17 × 52 = 884 (wk.); (2) 884 ÷ 5 = $176\frac{3}{4}$, or about 177 (times). **2.** 13 × 52 = 676 (wk.), 676 ÷ 5 = $135\frac{1}{5}$, or about 135 (times). **3.** 1 mi. = 5280 ft., $\frac{1}{4}$ × 5280 ft. = 1320 ft.

Page 136 **1.** 100° – 55° = 45° (or 46° if 55° is included). **2.** (1) 80° ÷ 4 = 20°, 20° + 37° = 57°; (2) 100° ÷ 4 = 25°, 25° + 37° = 62°; (3) 168° ÷ 4 = 42°, 42° + 37° = 79°; (4) 212° ÷ 4 = 53°, 53° + 37° = 90°. **3.** (1) 55° – 37° = 18°, 4 × 18 = 72 (chirps); (2) 100° – 37° = 63°, 4 × 63 = 252 (chirps). **4.** (1) 24 hr. = 1 da., 7 da. = 1 wk., 7 × 48 = 336 (drops); (2) 30 × 48 = 1440 (drops); (3) 1440 ÷ 60 = 24 (teaspoonfuls). **5.** 15 × 48 = 720 (drops), 720 ÷ 60 = 12 (teaspoonfuls). **6.** (1) 50 yr. – 4 yr. = 46 yr.; (2) 50 yr. – 17 yr. = 33 yr.; (3) 17 yr. – 4 yr. = 13 yr.

Page 137

Aim: To reteach place value to hundred thousands

Suggestions: There are many different ways to read the same number, and ex. 1–4 discuss these. Stress the use of the comma in reading large numbers. Ex. 6 suggests that pupils conduct research on the use of large numbers in local newspapers. This work can be extended to a study of large numbers in local town and city reports and in national magazines. The reading of large numbers and the knowledge of place value is only a start in *understanding* large numbers. How many pupils in your class can comprehend what a thousand really is? a hundred thousand? How long will it take a pupil to count by 1's from 1 to 100,000? Naturally, no pupil would undertake such an activity; but if a pupil were timed on how long it took him to count to 100, then you could easily compute how long it would take him to count to 100,000, with no rest period or stop in his constant talking. Also, how high in the air would a pile of $1 bills be stacked if you had $100,000 in the pile? Again, a measuring of the thickness of a pile of twenty-five $1 bills and a projection of this figure would show a rather fascinating result. Teachers are challenged to accomplish *more* than an understanding of place value and a reading of large numbers: what do these quantities really mean?

Key: **1.** 4 hundreds, 6 tens, and 7 ones; 8 hundreds, 3 tens, and 0 ones; 9 hundreds, 0 tens, and 7 ones; 7 hundreds, 0 tens, and 0 ones. **2.** 2 thousand, 7 hundred, 46, or 27 hundred 46; 5 thousand, 6 hundred, 9, or 56 hundred 9; 4 thousand, 5, or 40 hundred 5; 6 thousand, 20, or 60 hundred 20. **3.** 7 thousand, 6 hundred, 3, or 76 hundred 3; 9 thousand, 1 hundred, 62, or 91 hundred 62; 3 thousand, 84, or 30 hundred 84; 5 thousand, 2, or 50 hundred 2; 3 thousand, 8 hundred, 91, or 38 hundred 91; 3 thousand, 7 hundred, or 37 hundred. **5.** 47,613, 47 thousand, 6 hundred, 13; 28,507, 28 thousand, 5 hundred, 7; 40,507, 40 thousand, 5 hundred, 7; 30,070, 30 thousand, 70; 106,843, 106 thousand, 8 hundred, 43; 204,060, 204 thousand, 60; 700,204, 700 thousand, 2 hundred, 4; 308,500, 308 thousand, 5 hundred; 980,075, 980 thousand, 75; 903,006, 903 thousand, 6.

Page 138

Aim: To teach place value to hundred millions

Suggestions: *American Arithmetic, Grade 5* stresses the use of the comma in reading numbers beyond the thousands place. Ex. 3 provides fine practice in inserting the comma before reading the number, and ex. 9 tests an understanding of place value. There are other learnings which can well result from a study of this page, such as:

1. Each succeeding place to the left is 10 times greater than the preceding place.
2. In the number 2,675,348 there are 26 hundred-thousands, 2675 thousands, 26,753 hundreds, and so on.

Key: **2.** 5 million, 732 thousand, 108; 28 million, 906 thousand, 438; 175 million, 800 thousand, 240; 150 million. **3.** 5,472,186, 5 million, 472 thousand, 186;

83,672,000, 83 million, 672 thousand; 275,910,402, 275 million, 910 thousand, 402; 72,836,907, 72 million, 836 thousand, 907; 53,000,000, 53 million. **4.** 62,541. **5.** 304,056,000. **6.** 8,038,200. **7.** 106,003,200. **8.** 84,703,502. **9.** 999,999; 1,000.000; Yes; 999,999,999.

Page 139

Aim: To review basic addition skills

Suggestions: Ex. 2 should be completed orally. You might add other examples like the ones suggested in the book. The remaining exercises are to be completed in writing. You will notice that the work becomes progressively more difficult. Ex. 6 contains examples which require the pupil to be very good at adding by endings and understanding how to add columns of numbers with "gaps."

Key: **1.** 37, 105, 71, 54, 66, 87, 34, 100, 36, 53, 45, 63, 48, 62, 85, 92, 80, 78, 61; 35, 103, 69, 52, 64, 85, 32, 98, 34, 51, 43, 61, 46, 60, 83, 90, 78, 76, 59; 36, 104, 70, 53, 65, 86, 33, 99, 35, 52, 44, 62, 47, 61, 84, 91, 79, 77, 60; 34, 102, 68, 51, 63, 84, 31, 97, 33, 50, 42, 60, 45, 59, 82, 89, 77, 75, 58. **2.** 31; 27; 34; 27; 25; 24; 37; 24; 32; 25. **3.** \$1231.87. **4.** \$1386.67. **5.** \$1384.76. **6.** 22,161; 158,021; 215,789; 151,927; 144,806.

Page 140

Aim: To provide an oral review of measures and fractions

Suggestion: Although there are examples which cover topics other than measures and fractions, the primary objective of this page is to review fraction meanings, addition of like fractions, changing of fractions to lowest terms, and measure equivalents.

Key: **1.** $\frac{3}{4}$ yd. = 27 in.; Yes. **2.** 25¢ ÷ 6 = $4\frac{1}{6}$¢; 20¢ ÷ 5 = 4¢; Mary paid more. **4.** 30 min. **5.** 1, 1, 1, $\frac{1}{2}$, $1\frac{1}{2}$, 1. **6.** 1, 1, $1\frac{1}{4}$, $\frac{1}{2}$, 1, $1\frac{1}{2}$. **7.** $\frac{3}{4}$, $\frac{2}{3}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{8}$, $\frac{4}{5}$; $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{8}$, $\frac{2}{5}$, $\frac{1}{3}$. **8.** See the answers for ex. 1, p. 19, for the multiplication facts. **9.** 13, 20, 27, 34, 41, 48, 55, 62. **10.** 15, 24, 33, 42, 51, 60, 69, 78. **11.** 61, 77, 5, 29, 53, 37, 13, 45, 21, 69. **12.** 67, 85, 4, 31, 58, 40, 13, 49, 22, 76. **13.** $\frac{1}{2}$, 27, 3. **14.** 4, 72, 8. **15.** $\frac{1}{2}$, 120, 1. **16.** $\frac{1}{4}$, 2, 2.

Page 141

Aim: To review basic subtraction skills

Suggestion: All the process steps in subtraction of whole numbers are reviewed on this page. Notice the gradation of difficulty in ex. 1 and 2.

Key: **1.** 152; 521; 701; 225; 360; 446; 386. **2.** 488; 148; 634; 137; 332; 357; 167. **3.** \$10.00 − \$6.25 = \$3.75. **4.** 1900 − 1776 = 124 (yr.); 1955 − 1776 = 179 (yr.). **5.** 2212; 692; 845; 39,196; 5077; 5626. **6.** 7364; 157; 7952; 8591; 16,238; 29,288. **7.** \$275.00 − \$168.25 = \$106.75. **8.** 2016 − 1984 = 32 (more boys). **9.** \$14.84. **10.** \$106.25. **11.** \$547.55. **12.** 29,216 mi. − 27,864 mi. = 1352 mi.

Page 142

Aim: To present two-step problems dealing with everyday experiences

Suggestion: Although problem 1 would occur only in a fisherman's paradise, the remaining problems might be found in any community: costs of movie tickets, parties, and drygoods; distances in riding a bicycle, and so on.

Key: **1.** $5\frac{3}{4}$ lb. − $4\frac{1}{4}$ lb. = $1\frac{1}{2}$ lb. **2.** \$.35 + \$.35 + \$.65 = \$1.35, \$2.00 − \$1.35 = \$.65. **3.** \$7.72 − \$1.00 = \$6.72, \$6.72 ÷ 32 = \$.21. **4.** 76 + 72 + 86 + 64 + 82 = 380, 380 ÷ 5 = 76. **5.** $6\frac{3}{4}$ yd. − $5\frac{1}{4}$ yd. = $1\frac{1}{2}$ yd. **6.** $3\frac{1}{4}$ mi. + $8\frac{3}{4}$ mi. = 12 mi. **7.** 5 doz. = 60 (cookies), 60 × 3¢ = 180¢ or \$1.80, \$1.80 + \$1.50 = \$3.30. **8.** 5 × \$.68 = \$3.40, 3 × \$1.25 = \$3.75, \$3.40 + \$3.75 = \$7.15, \$17.00 − \$7.15 = \$9.85. **9.** (1) 256 + 208 = 464 (children), 464 ÷ 4 = 116 (qt.); (2) 116 ÷ 4 = 29 (gal.); (3) 5 × 29 gal. = 145 gal.

Page 143

Aim: To review the basic skills of multiplication, addition, subtraction, and division

Key: **1.** \$1061.20. **2.** \$133,950. **3.** \$.89. **4.** (Change \$39.90 to 3990¢.) 42 books. **5.** 271,755; 248,976; 617,572; 96,696; 42,315; \$1197.56. **6.** 369,944; 870,016; 131,127; 380,689; 395,648; \$3127.02. **7.** 56,169; 243,000; 128,905; 112,500; 699,545; \$1233.18. **8.** 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73; 1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73; 1, 9, 17, 25, 33, 41, 49, 57, 65, 73. **9.** 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56; 2, 8, 14, 20, 26, 32, 38, 44, 50, 56; 2, 11, 20, 29, 38, 47, 56. **10.** 5297, 7102, 6416, 2302, 3984; 2125, 3746, 5444, 564, 16. **11.** 6525, 8294, 6378, 5007, 6105; 2009, 4778, 1420, 1009, 3587. **12.** 23 R10; 44 R38; 31 R15; \$.89. **13.** 38 R42; 48; 23; \$.47. **14.** 39 R11; 62 R12; 52; \$.75. **15.** 73 R49; 24; 42 R60; \$.53.

Pages 144–145

Aim: To extend work on Roman numerals to include the writing of the current year

Suggestions: The main purpose in the teaching of Roman numerals is to enable pupils to read them. Emphasize the two rules related to Roman numerals which are stated in ex. 6 on page 144. When the first letter has a *greater* value than the second, you *add* the numbers represented by the letters; when the first letter has a *smaller* value than the second, you *subtract* the first from the second. Attention is called to ex. 8, in which the alternate Roman numerals for 4 and 900 are pointed out.

Key: **1.** 14. **2.** 25. **3.** 1952. **9.** 126; 2150; 140; 1910. **10.** 142; 64; 700; 1466. **11.** 79; 440; 1600; 2047. **12.** 166; 47; 610; 1969. **13.** XLVII; LXXXIV; XXVIII; CDXCVI; MDCXX; MDCCCLXXIII. **14.** XCIII; LXXVI; LIII; CCCXVII; MDCCCXLV; MCMXLIX. **16.** MCDXCII. **17.** 1804. **18.** 1954.

Pages 146–147

Aim: To explain the meaning and importance of zero and the meaning of place value in connection with our system of writing numbers

Suggestions: Our system of writing numbers uses the Hindu-Arabic numerals, which are usually called the Arabic numerals. The important feature of our system lies in the fact that it has place value, which means that the value of each figure depends upon the place it occupies. Our system contains the figure 0, which we call *zero*. It is this 0 that gives our system its flexibility. By contrast, the Roman system of writing numbers has no 0 and has no place value.

The important features of our number system, including place value, are carefully described on these two pages, which should be read most carefully. The advantages of our Hindu-Arabic system of writing numbers become more apparent when we compare it with the Roman system, which does not have such advantages. This comparison is made in ex. 7–9 on page 147. The Romans never computed with their numerals as we compute with our Hindu-Arabic numerals. Instead, they did all their adding, subtracting, multiplying, and dividing mechanically on a framework called an *abacus*, which corresponds to our modern computing machines. There are still many peoples in the world who do their computing on an abacus instead of computing as we do. The pupils will find it of interest to see a suan pan, which is the abacus used by the Chinese. If there is a Chinese businessman in your city, he will probably have a suan pan. The pupils will be interested also in seeing a modern adding machine which is used in banks and other offices.

Key: **4.** Value of 8: 8 ones, 8 tens, 8 hundreds, 8 thousands; value of 6: 6 hundreds, 6 ones, 6 tens, 6 hundreds. **9.** L = 50; X = 10.

Page 148

Aim: To review basic multiplication skills

Suggestion: Remind pupils that in ex. 1–3 the operation within the parentheses is performed first.

Key: **1.** 55, 28, 39, 35. **2.** 34, 71, 53, 61. **3.** 47, 20, 68, 33. **4.** 5395; 2184. **5.** 115,038; 577,440. **6.** $32.50. **7.** $799.68. **8.** 7268; 386,582; 366,120; 142,692. **9.** 2812; 206,208; 117,607; 879,360. **10.** 4320; 723,150; 403,788; 245,735. **11.** 4704; 32,496; 188,991; 543,906. **12.** $1394.90. **13.** $1353.09. **14.** 335,793; 105,984; 90,132; 210,450; 437,640; 186,048. **15.** 291,972; 286,738; 126,276; 537,540; 296,925; 145,512. **16.** 306,708; 156,604; 602,602; 264,060; 171,690; 250,656. **17.** 589,651; 359,344; 255,916; 515,380; 201,365; 205,137.

Page 149

Aim: To present two-step problems dealing primarily with business

Suggestions: Pupils at this age are beginning to think of earning money. The desire to earn money is one of the natural drives of the early adolescent. Be sure that the children estimate answers before computation and label all answers.

Key: **1.** \$3.50 ÷ 2 = \$1.75, \$1.75 − \$.25 = \$1.50. **2.** 350° − 275° = 75°. **3.** 344 mi. ÷ 8 = 43 mi. **4.** $\frac{1}{4}$ × 24¢ = 6¢, $\frac{3}{4}$ × 24¢ = 18¢; $\frac{1}{4}$ × 40¢ = 10¢, $\frac{3}{4}$ × 40¢ = 30¢. **5.** 4 × \$5.40 = \$21.60, 4 doz. = 4 × 12 = 48 (boxes), 48 − 3 = 45 (boxes), 45 × \$.75 = \$33.75, \$33.75 − \$21.60 = \$12.15. **6.** 50¢ ÷ 3 = 16$\frac{2}{3}$¢. **7.** 693 mi. ÷ 11 = 63 mi. **8.** (1) 75¢ − 50¢ = 25¢, 1000¢ ÷ 25¢ = 40 (wk.); (2) 675¢ ÷ 25¢ = 27 (wk.). **9.** 2 hr. + 2$\frac{3}{4}$ hr. + 2$\frac{1}{4}$ hr. + 1 hr. = 8 hr., 8 × 75¢ = 600¢, or \$6.00. **10.** 7 quarters = 7 × 25¢ = 175¢, 3 dimes = 3 × 10¢ = 30¢, 13 nickels = 13 × 5¢ = 65¢, 175¢ + 30¢ + 65¢ + 7¢ = 277¢, or \$2.77. **11.** 14$\frac{3}{4}$ in. − 11$\frac{1}{4}$ in. = 3$\frac{1}{2}$ in.

Page 150

Aim: To reteach the rounding off of numbers

Suggestions: The rounding off of numbers to the nearest ten, hundred, thousand, and so on requires an understanding of the tens nature of our number system and is fundamental to understanding how to estimate answers. Rounding off becomes an integral part of estimating the quotients in examples with 2-figure divisors; and in upper grades it will assist pupils in readily determining the square root of numbers by the approximation method. *American Arithmetic, Grade 4* and *Grade 5* develop this skill carefully and maintain it by frequent exercises.

Key: **1.** 5000, 8000, 9000, 3000, 4000. **2.** 100, 200, 300, 400, 500, 600, 700, 800, 900; 500, 200, 900, 700. **3.** 10, 20, 30, 40, 50, 60, 70, 80, 90, 100; 90 because 87 is nearer to 90 than to 80. **4.** 40, 20, 60, 80, 60, 50, 90, 80. **5.** 60 mi., 30 mi., 30 mi., 90 mi., 70 mi. **6.** \$.20, \$.90, \$.50, \$.60, \$.20, \$.40. **7.** 3 boxes; 4 boxes.

Page 151

Aim: To reteach the estimating of answers to word problems

Suggestions: The Guides for Grades 4 and 5 continually stress the importance of estimating an answer before beginning the actual calculation. Estimation is the first step in solving a problem. The first three problems on this page show the thought processes necessary in mental estimation. Encourage pupils to think in a similar manner in completing problems 4–9. Some teachers require students to do this thinking aloud so that all class members will profit from this reteaching.

Workbook Reference: Arithmetic Workshop, Book 5, page 74

Key: **2.** Yes, Bill forgot to carry the 1 to the hundreds place. 2 × \$2.96 = \$5.92. **4.** \$5.98 is about \$6.00, 3 × \$6.00 = \$18.00 (estimate); 3 × \$5.98 = \$17.94 (exact). **5.** \$14.97 is about \$15.00, \$21.10 is about \$21.00, \$21.00 − \$15.00 = \$6.00 (estimate); \$21.10 − \$14.97 = \$6.13 (exact). **6.** \$80.48 is about \$80.00, \$80.00 ÷ 4 = \$20.00 (estimate); \$80.48 ÷ 4 = \$20.12 (exact). **7.** \$1.02 is about \$1.00, 40 × \$1.00 = \$40.00 (estimate); 40 × \$1.02 = \$40.80 (exact). **8.** \$7.96 is about \$8.00, \$11.89 is about \$12.00, \$8.00 + \$12.00 = \$20.00 (estimate); \$7.96 + \$11.89 = \$19.85 (exact). **9.** \$20 + \$8 = \$28, \$14.95 is about \$15.00, \$4.95 is about \$5.00, \$15.00 + \$5.00 = \$20.00 (estimate), \$28.00 − \$20.00 = \$8.00 (estimate); \$14.95 + \$4.95 = \$19.90, \$28.00 − \$19.90 = \$8.10 (exact).

Page 152

Aim: To provide pupils further practice in the estimating of answers to word problems

Suggestion: Each problem on this page is followed by three probable estimates. Pupils are asked to select the estimate they believe is the best and then work the problem to check on their estimate.

Key: **1.** 31 qt. is about 30 qt., 19¢ is about 20¢, 30 × 20¢ = 600¢ or $6.00 (estimate); 31 × 19¢ = $5.89 (exact). **2.** 5982 mi. is about 6000 mi., 6000 mi. ÷ 6 = 1000 mi. (estimate); 5982 mi. ÷ 6 = 997 mi. (exact). **3.** 95¢ is about $1.00, 29¢ is about $.30, 6 × $1.00 = $6.00, 4 × $.30 = $1.20, $6.00 + $1.20 = $7.20, or $7.00 (estimate); 6 × $.95 = $5.70, 4 × $.29 = $1.16, $5.70 + $1.16 = $6.86 (exact). **4.** 49¢ is about 50¢ or $.50, 20 × $.50 = $10.00 (estimate); 20 × $.49 = $9.80 (exact). **5.** $89.50 is about $90.00, $91.00 is about $90.00, $90.00 + $90.00 = $180.00 (estimate); $89.50 + $91.00 = $180.50 (exact). **6.** 362 mi. is about 360 mi., 360 mi. ÷ 9 = 40 mi. (estimate); 362 mi. ÷ 9 = $40\frac{2}{9}$ mi. (exact). **7.** 792 is about 800, 800 ÷ 8 = 100 (plants) (estimate); 792 ÷ 8 = 99 (plants) (exact). **8.** $3.17 is about $3.00, $2.95 is about $3.00, $3.00 + $3.00 = $6.00, 2 × $5.00 = $10.00, $10.00 − $6.00 = $4.00 (estimate); $3.17 + $2.95 = $6.12, $10.00 − $6.12 = $3.88 (exact). **9.** 24¢ is about 25¢ or $\frac{1}{4}$ of a dollar, 30 × $\$\frac{1}{4}$ = $7.50 (estimate); 30 × 24¢ = 720¢ or $7.20 (exact).

Page 153

Aim: To teach long division with 2-figure divisors ending in 6, 7, 8, or 9

Suggestions: In all the preceding work in long division in this book, each of the exercises has had a 2-figure divisor ending in 0 to 5; and the quotient figures have been estimated by using Rule I, which is stated on page 85 of the text. According to this rule, quotient figures have been estimated by dividing by the first figure of the divisor. On page 153 divisors ending in 6, 7, 8, and 9 are now introduced for the first time. In exercises having these divisors, quotient figures will be estimated by using the rule indicated in ex. 3, which, for convenience, will be called Rule II. By Rule II, quotient figures are estimated by dividing by 1 *more than the first figure* of the divisor. For example, if the divisor is 38, quotient figures will be estimated by dividing by 4.

In the method of long division used in this book, Rules I and II play a very important part, since they make it possible to obtain the correct quotient figure on first trial in 80% of all cases. Therefore, quotient figures need to be corrected in only 20% of the cases; and in practically all these cases, only one correction is necessary.

Workbook Reference: Arithmetic Workshop, Book 5, pages 61 and 62

Key: **2.** 40, 50, 20, 60, 30, 80, 70. **3.** When a two-place divisor ends in 6, 7, 8, or 9, divide by one more than the first figure of the divisor to find each quotient figure. **4.** 3 R8; 1 R32; 2 R15; 1 R24; 2 R19; 1 R34. **5.** 2 R11; 1 R36; 2 R20; 2 R13; 3 R15; 2 R15. **6.** 1 R14; 3 R11; 2 R13; 3 R13; 1 R34; 2 R19. **7.** 3 R11;

1 R19; 3 R15; 2 R17; 1 R22; 1 R21. **8.** 1 R25; 2 R9; 4 R7; 2 R25; 2 R4; 2 R11. **9.** 4 R14; 1 R16; 3 R9; 2 R5; 2 R2; 3 R8.

Pages 154–155

Aim: To give practice in division by 2-figure divisors ending in 6, 7, 8, or 9

Suggestion: On these two pages Rule II is used in every instance.

Key: Page 154 **1.** Yes. **3.** 70, 60, 80, 50, 30, 40, 50, 70. **4.** 8 R13; 7 R32; 5 R29; 6 R30; 8 R37. **5.** 4 R12; 9 R32; 6 R57; 5 R36; 7 R40. **6.** 9 R42; 8 R25; 7 R43; 8 R18; 4 R20. **7.** 6 R28; 7 R54; 9 R45; 9 R68; 6 R40. **8.** 5 R42; 3 R79; 7 R28; 3 R35; 8 R28. **9.** 7 R19; 9 R33; 8 R27; 4 R27; 6 R75.

Page 155 **1.** 419 + 9 = 428 (persons), 428 ÷ 48 = 8 R44, or 8 full busses with 44 persons in the extra bus. **2.** 200¢ ÷ 59¢ = 3 R23¢, or 3 doz. with 23¢ change. **3.** 49 is about 50, 350 ÷ 50 = 7 (mi.). **4.** 39 mi. is about 40 mi., 240 mi. ÷ 40 mi. = 6 (hr.); 160 mi. ÷ 40 mi. = 4 (hr.). **5.** 5 R5; 6 R6. **6.** 4 R32; 3 R16; 7 R40; 8 R26; 5 R63. **7.** 6 R38; 3 R30; 8 R49; 9 R13; 5 R32. **8.** 6 R36; 8 R30; 6 R24; 5 R29; 9 R42. **9.** 8 R45; 3 R45; 8 R36; 7 R49; 6 R26. **10.** 5 R52; 6 R31; 4 R20; 7 R32; 7 R25. **11.** 6 R24; 8 R35; 4 R24; 6 R25; 6 R21. **12.** 5 R46; 7 R52; 5 R12; 5 R23; 7 R42.

Pages 156–157

Aim: To extend the application of Rule II to 2-figure quotients

Workbook Reference: Arithmetic Workshop, Book 5, page 62

Key: Page 156 **2.** 14 R9; 13 R36; 62 R10; 46 R12; 33 R24. **3.** 23 R9; 28 R11; 35 R17; 68 R37; 21 R14. **4.** 26 R18; 24 R17; 37 R24; 64 R19; 25 R27. **5.** 24 R9; 16 R28; 56 R6; 65 R57; 23 R16. **6.** 25 R10; 27 R16; 56 R22; 45 R27; 42 R20. **7.** 22 R15; 32 R7; 65 R35; 74 R5; 75 R33. **8.** 34 R18; 23 R34; 33 R44; 23 R24; 54 R17. **9.** 34 R16; 23 R19; 53 R15; 26 R25; 53 R9.

Page 157 **1.** 2500¢ ÷ 49 = 51¢ R1¢, or about 51¢. **2.** 1540 ÷ 48 = 32 R4, or 32 rows with 4 cakes left over. **3.** 730 ÷ 29 = 25 R5, or 25 children with 5 teams having 1 extra child. **4.** 730 ÷ 48 = 15 R10, or 15 arm bands with 10 children making 1 extra. **5.** 34 R26; 34 R42; 69 R75; 23 R48; 54 R23. **6.** 56 R33; 18 R40; 36 R32; 84 R30; 35 R18. **7.** 57 R29; 57 R28; 27 R8; 23 R25; 58 R49. **8.** 65 R24; 67 R19; 67 R31; 65 R11; 46 R19. **9.** 75 R5; 36 R24; 94 R14; 46 R24; 37 R23. **10.** 75 R10; 68 R24; 25 R39; 35 R14; 96 R11.

Page 158

Aim: To review measures and introduce the term *gross*

Suggestions: Ex. 6 introduces a new measure, *gross.* This term may be associated with the buying of pencils, since many schools buy pencils by the half-gross box. Crayons also are purchased by the gross, $\frac{1}{2}$ gross, and $\frac{1}{4}$ gross. Everyday usage of this measure by children is not great. Ex. 7–15 should be completed orally.

Key: **1.** 19— (present year) − 1649 = more than 300 yr., or about 3 centuries. **2.** 4 × 20 = 80; 80 + 6 = 86 (yr.). **3.** 1 mi. = 5280 ft., 5280 ft. ÷ 8 = 660 ft.

4. $3 \times 365 = 1095$ (glasses), 1 qt. = 4 glasses, $1095 \div 4 = 273\frac{3}{4}$ (qt.). **5.** (1) $3 \times 365 = 1095$ (eggs), $1095 \div 12 = 91\frac{1}{4}$ (doz. eggs); (2) 30 doz. = 360, $365 - 360 = 5$, or 5 eggs more than a case. **6.** (1) 144 pencils; (2) 432 pencils. **7.** $\frac{1}{4}$; $\frac{1}{8}$; 12. **8.** 1; $\frac{1}{2}$; 3. **9.** $\frac{1}{3}$; 2640; 10. **10.** $\frac{1}{4}$; 45; 9. **11.** 12; 120; 24. **12.** $\frac{1}{2}$; 30; $\frac{3}{16}$. **13.** $\frac{1}{7}$; $\frac{1}{12}$; 660. **14.** 4; 2; 1500. **15.** 1000; 6000; 3.

Page 159

Aim: To extend Rule II to long division with 3-figure quotients

Suggestion: The work on this page is an extension of the skill developed on page 153. No new skills are needed to complete these examples.

Workbook Reference: Arithmetic Workshop, Book 5, page 63

Key: **2.** 178 mi. **3.** 164 mi. **4.** 135 R11; 123; 325 R10; 471. **5.** 124 R4; 234; 734 R6; 368. **6.** 183; 243 R5; 235 R25; 563 R5. **7.** 212; 134; 235 R32; 234 R50. **8.** 425 R9; 224 R9; 688 R43; 355 R25.

Pages 160–161

Aim: To present problems dealing with winter sports

Suggestions: *American Arithmetics* provide problem-solving situations dealing with a variety of topics. Winter sports challenge the imagination of most children; and on these pages the arithmetic of bobsledding, iceboating, and skating is developed. If your pupils engage in other kinds of winter sports, encourage them to develop problems dealing with their actual experiences.

Key: **1.** Nov., Dec., Jan., Feb., and Mar. make 5 mo. **2.** 3 in. + $4\frac{3}{4}$ in. + 6 in. + 9 in. + $7\frac{1}{4}$ in. = 30 in., 30 in. $\div$ 5 = 6 in. **3.** (1) 5280 ft. $\div$ 80 = 66 ft.; (2) 60×66 ft. = 3960 ft.; (3) $\frac{1}{2}$ mi. = 2640 ft., $\frac{3}{4}$ mi. = 3960 ft., $\frac{3}{4}$ mi. **4.** (1) $3 \times 2640 = 7920$ (ft.); (2) more than 1 mi. **5.** 1 min. 20 sec. = 80 sec., $5280 \div 80 = 66$ (ft.). **6.** $5280 \div 60 = 88$ (ft.). **7.** $2640 \div 22 = 120$ (sec.), $120 \div 60 = 2$ (min.). **8.** $\frac{1}{6}$ mi. = 880 ft., $\frac{1}{3}$ min. = 20 sec., $880 \div 20 = 44$ (ft.). **9.** $84\frac{1}{2}$ lb. + $81\frac{1}{2}$ lb. = 166 lb. **10.** (1) 25 min. + 5 min. = 30 min.; (2) 30 min. = $\frac{1}{2}$ hr. **11.** \$10 + \$5 + \$3 + \$15 = \$33.

Page 162

Aim: To review addition and subtraction of fractions with like denominators

Key: **1.** $\frac{2}{3}$; $\frac{3}{4}$; $\frac{3}{4}$; $\frac{5}{6}$; $\frac{2}{3}$; $\frac{3}{5}$; $\frac{3}{4}$; $\frac{1}{4}$; $\frac{5}{8}$; $\frac{3}{4}$. **2.** $3\frac{3}{4}$; $3\frac{1}{3}$; $3\frac{2}{5}$; 2; $1\frac{1}{2}$; 1; $1\frac{2}{3}$; $1\frac{3}{5}$. **3.** Yes, because both parts of the fraction can be divided by 4 to get the same value. **4.** $80\frac{3}{4}$ lb. $-$ $72\frac{1}{4}$ lb. = $8\frac{1}{2}$ lb. **5.** $10\frac{6}{10}$ mi. or $10\frac{3}{5}$ mi. **6.** $\frac{4}{5}$; $\frac{3}{4}$; $5\frac{1}{2}$; $4\frac{3}{4}$; $6\frac{2}{3}$; $4\frac{2}{3}$; $6\frac{3}{5}$; $4\frac{1}{3}$. **7.** $1\frac{5}{6}$; 1; 11; 13; 6; $4\frac{3}{4}$; $10\frac{1}{4}$; $9\frac{1}{5}$. **8.** $\frac{3}{4}$ mi. + $2\frac{3}{4}$ mi. = $3\frac{1}{2}$ mi.; $2\frac{3}{4}$ mi. + $2\frac{3}{4}$ mi. = $5\frac{1}{2}$ mi.; $\frac{3}{4}$ mi. + $\frac{3}{4}$ mi. = $1\frac{1}{2}$ mi. **9.** $3\frac{11}{16}$ lb. $-$ $3\frac{3}{16}$ lb. = $\frac{1}{2}$ lb. **10.** $\frac{1}{4}$; $\frac{3}{5}$; $1\frac{1}{2}$; $2\frac{5}{8}$; $\frac{1}{2}$; $2\frac{1}{2}$; $7\frac{3}{8}$; $2\frac{3}{5}$. **11.** $\frac{1}{3}$; $\frac{2}{5}$; $2\frac{2}{3}$; $1\frac{5}{6}$; $3\frac{4}{5}$; $2\frac{3}{5}$; $2\frac{1}{6}$; $1\frac{5}{8}$.

Page 163

Aim: To provide more fun with magic squares

Suggestions: Magic squares are discussed from time to time in *American Arithmetic, Grade 4* and *Grade 5*. Page 26 of the textbook develops the story of the magic square. The work on page 163 is for *enjoyment only.* Do not attempt to secure mastery of this work by all pupils, since the slower pupil may not readily understand the theory of magic squares.

Key: 1. Yes, with the sum of 798. **2.** Yes, with the sum of 363. **3.** Yes, with the sum of 1617.

314	282	442
474	346	218
250	410	378

4. Total: 1038

631	722	657
696	670	644
683	618	709

5. Total: 2010

667	743	363
287	591	895
819	439	515

6. Total: 1773

457	992	243
350	564	778
885	136	671

7. Total: 1692

832	643	778
697	751	805
724	859	670

8. Total: 2253

522	409	974
1087	635	183
296	861	748

9. Total: 1905

Page 164

Aim: To introduce division of dollars and cents in exercises with 3-figure quotients

Suggestions: The new element on this page is the introduction of quotients of 3 figures which represent dollars and cents. In this work the first figure of the quotient must be written in the proper position over the dividend; otherwise, the decimal point in the quotient will fall in the wrong position.

Key: 2. 1 yr. = 12 mo., \$75.48 ÷ 12 = \$6.29. **3.** 1 yr. = 12 mo., \$146.76 ÷ 12 = \$12.23. **4.** \$35.10 ÷ 28 = \$1.25 with \$.10 over, or about \$1.25. **5.** \$2.76; \$1.44 R16¢; \$4.82 R2¢; \$6.22 R7¢. **6.** \$1.22; \$2.77 R21¢; \$7.27 R27¢; \$5.41 R11¢. **7.** \$3.14; \$2.55 R36¢; \$7.36 R19¢; \$3.74 R12¢. **8.** \$2.34 R17¢; \$2.19 R10¢; \$8.64 R11¢; \$3.24 R7¢. **9.** \$1.17 R9¢; \$2.35 R13¢; \$2.45; \$8.42 R9¢. **10.** \$1.24 R3¢; \$1.15; \$5.43; \$3.56 R33¢. **11.** \$2.65; \$1.86; \$7.28; \$9.53.

Page 165

Aim: To review fundamental skills in addition, subtraction, multiplication, and division of whole numbers

Suggestion: This is the fourth timed test presented in this book. Instructions for giving this test will be found in this Guide under instructions for teaching page 71.

Key: **1.** 3303; 1899; 2138; 1802; 3584; 2106. **2.** 14,166; 9914; 41,376; 13,469. **3.** 5947; 58,627; 7650; 2825. **4.** 143,013; 115,785; 38,703; 86,450. **5.** 72,288; 102,564; 117,711; 233,244. **6.** 97 R15; 43 R25; 87 R10; 83 R12. **7.** 43 R19; 35 R17; 76 R25; 56 R27.

Pages 166–167

Aim: To show how to correct quotient figures when Rule II is used in connection with divisors ending in 6 to 9

Suggestions: In this book Rule II, which is suggested on page 153, is used to estimate quotient figures when the divisors end in 6 to 9. Sometimes with this rule, the quotient obtained is 1 smaller than it should be; hence, the quotient figure must be corrected by making it 1 larger. This situation is illustrated in ex. 1 on page 166, which should have careful study. When a quotient figure is too small, the remainder will be equal to, or larger than, the divisor; therefore, the remainder should always be compared with the divisor. When the correct quotient figure has been found, the new remainder will be smaller than the divisor. Rule II is a most valuable method of finding quotient figures for divisors ending in 6 to 9, since it gives the correct quotient figure on first trial in 80% of all cases. In the other 20% of cases, only one correction is necessary, except in 1 case out of every 2250 cases when two corrections are necessary. Those rare situations in which two corrections of a quotient figure are necessary occur only in a certain few examples having a divisor of 26. Two corrections are never necessary when any of the other divisors covered by Rule II are used. It is evident, therefore, that the possibility of having to correct the quotient figure twice with Rule II is almost negligible. If Rule II is not used in connection with divisors ending in 6 to 9, frequent corrections of quotient figures are necessary, as is shown on pages 4–5 of this Guide.

Key: Page 166 **2.** 8 R3; 9; 7 R8; 6 R3; 6 R6. **3.** 8 R3; 5 R14; 9 R4; 8 R4; 8 R2. **4.** 6 R7; 7 R4; 6 R2; 7 R15; 6 R1. **5.** 7; 6 R6; 8 R3; 6 R10; 8 R3. **6.** 8 R3; 7 R9; 9 R7; 6; 9 R14. **7.** 6 R5; 7 R5; 7; 5 R1; 6.

Page 167 **1.** \$.08. **2.** 4 boxes. **3.** 4 yd. = 4 × 36 in. = 144 in., $\frac{3}{4} \times 36$ in. = 27 in., 144 in. + 27 in. = 171 in., 171 in. ÷ 19 in. = 9 (baskets). **4.** 6 eggs. **5.** 9 R11; 6; 6 R8; 5 R8; 8 R7. **6.** 5; 6 R4; 7 R9; 8; 9 R21. **7.** 8; 8 R19; 6 R9; 6; 7 R16. **8.** 8; 8; 7 R14; 6 R4; 9 R12. **9.** 6; 8 R6; 5; 6 R8; 9 R16. **10.** 5 R5; 8; 8 R4; 6 R12; 8 R11. **11.** 4 times. **12.** 8 mi.

Pages 168–169

Aim: To provide more practice in correcting quotient figures when Rule II is used in exercises having quotients of two and three figures

Suggestions: The word problems on these pages show the practical application of the skill taught on page 166. Ex. 7–17 on page 169 provide repetitive practice.

Key: **2.** 52 × \$.60 = \$31.20, \$31.20 ÷ 48 = \$.65. **3.** 18 × 78 in. = 1404 in., 1404 in. ÷ 36 in. = 39 (yd.). **4.** 39 × \$.48 = \$18.72, \$18.72 ÷ 36 = \$.52. **5.** 27

× 88 in. = 2376 in., 2376 in. ÷ 36 in. = 66 (yd.). **6.** 66 × \$.63 = \$41.58; \$41.58 ÷ 54 = \$.77. **7.** 82 R4; 147; 95; 743 R8. **8.** 52; 56; 93; 656. **9.** 63 R3; 64 R11; 62; 362. **10.** 72; 67; 83; 486. **11.** 43 R5; 46; 62 R1; 596. **12.** 75; 63; 54; 724 R19. **13.** 73; 62; 52; 517 R7. **14.** 273; 95; 63; 518 R13. **15.** 64; 64; 62; 532. **16.** 52; 84; 75; 97; 54. **17.** 64; 84; 82; 78; 67 R9.

Page 170

Aims: To test vocabulary and to present problems without numbers

Key: **1.** Multiplier. **2.** Denominator. **3.** Mixed number. **4.** An improper fraction. **5.** Quotient. **6.** Average. **7.** Divide the cost by the number of children. **8.** Add the number of children in all the rooms. **9.** Subtract the lower price from the higher price. **10.** Multiply the cost of 1 yard by the number of yards.

Page 171

Aim: To take up zero difficulties in connection with 3-figure quotients

Suggestions: In ex. 1 on page 171 two examples are worked out in both a long way and a short way. These examples must be studied carefully in connection with the explanations printed under them. In fact, these examples should be put on the board so that you can point out the differences between the long and the short ways. As soon as these differences are understood, the pupils should use the short way if they are able to do so. Ex. 3–7 should be studied in a similar way.

Key: **2.** The final steps are left out. **3.** 120 R3; 360 R7; 460 R4; 370 R12. **4.** 310 R16; 260 R25; 560; 760 R14. **5.** 140 R23; 430 R4; 560; 860 R3. **6.** 470 R8; 250; 280; 520 R8. **7.** 230; 190 R10; 230 R5; 890.

Page 172

Aim: To provide oral practice

Suggestions: Ex. 10, 11, 14, and 15 may be expanded to provide more exercises of the same nature. Many teachers will increase the complexity of ex. 10 and 11 by number games such as this one:

> "Begin with 6, add 3, subtract 2, multiply by 4, subtract 3, divide by 5, add 4. What is the answer?" (9)

Key: **1.** 9 in. **2.** $\frac{3}{4}$ lb. **3.** 25 min. **4.** 30¢. **5.** 5. **6.** 9 eggs. **7.** 45¢. **8.** $4\frac{1}{2}$ yd. **9.** 5 hr.; \$3.00. **10.** 60, 26, 62, 23. **11.** 47, 19, 49, 52. **12.** 40, 900, 609, 1650, 19, 1967. **13.** XXXVIII, XLVI, LIV, CCCLX, MDCCLXXVI, MMD, MCMLVIII. **14.** 66, 97, 40, 67, 88, 53, 82, 61; 67, 98, 41, 68, 89, 54, 83, 62. **15.** 44, 99, 85, 43, 37, 23, 71, 95; 45, 100, 86, 44, 38, 24, 72, 96.

Page 173

Aim: To extend work with zeros in the quotient

Suggestion: This page redevelops the work started on page 171 and provides additional practice examples.

Workbook Reference: Arithmetic Workshop, Book 5, page 71

Key: **2.** Steps (a) and (b) are left out. **3.** 703 R17; 701 R7; 309. **4.** 607; 409 R1; 406. **5.** 705; 702; 604. **6.** 503 R3; 401 R6; 903. **7.** 904 R5; 705 R8; 607 R14. **8.** 803; 309 R7; 603 R11. **9.** 704 R11; 603; 408 R8.

Pages 174–175

Aim: To give suggestions for using the troublesome divisors 13 to 19

Suggestions: Rule I for estimating quotient figures, which is given on page 85 of the text, is intended for use with divisors ending in 1 to 5 from 21 to 95. This rule is not suitable for use with the divisors 13, 14, and 15 because too many corrections of quotient figures are required. For these three divisors, the procedure recommended in paragraph (1) under ex. 1 on page 174 should be followed. By this procedure you estimate the quotient figure as closely as you can and then multiply and subtract to see whether your estimate is right.

For the divisors 16, 17, 18, and 19, the procedure recommended in paragraph (2) under ex. 1 on page 174 should be followed. Notice that for the divisors 16 to 19 you should use Rule II, which will require no more than two corrections for the divisors 16 and 17 and no more than one correction for the divisors 18 and 19. See the footnote on page 174.

The divisors 13 to 19 have long been regarded as troublesome divisors, and they are really troublesome when treated by the methods of long division used in most other textbooks. These divisors cease to be troublesome, however, if they are handled according to the suggestions given on page 174 of the text. The divisors 11 and 12 are covered on page 105 of the text.

Workbook Reference: Arithmetic Workshop, Book 5, page 72

Key: Page 175 **1.** In one week Jim will have to save $.69. **2.** $.72. **3.** 27; 96; 64; 67; 59. **4.** 24; 95; 95; 85; 85. **5.** 45; 92 R5; 64 R13; 99 R3; 85. **6.** 48; 98; 89; 68 R10; 97. **7.** 29; 97 R5; 89; 79; 87 R7. **8.** 35 R9; 98 R7; 84; 462; 85 R6. **9.** 12 boxes; 15 boxes. **10.** 47; 54 R8; 98 R13; 328. **11.** 56; 76; 83 R1; 283. **12.** 25; 76 R8; 89 R7; 96 R8.

Page 176

Aim: To provide a written review involving whole numbers and fractions

Key: **3.** $\frac{2}{5}$; $\frac{3}{4}$; $\frac{3}{5}$; $\frac{3}{4}$; $\frac{5}{6}$; $\frac{7}{10}$. **4.** $4\frac{2}{3}$; 6; $5\frac{1}{4}$; $2\frac{2}{3}$; 1. **5.** Multiply the divisor by the quotient and add the remainder. **6.** $3\frac{1}{2}$. **7.** 21 qt.; 31 qt. **8.** $\frac{1}{3}$ yd.; $\frac{3}{4}$ yd. **9.** $\frac{1}{2}$; 1; 4; $9\frac{1}{5}$; $14\frac{1}{5}$; 9; $6\frac{7}{8}$. **10.** $\frac{1}{3}$; $\frac{3}{4}$; $1\frac{1}{2}$; $2\frac{3}{5}$; $3\frac{2}{5}$; $8\frac{1}{3}$; $4\frac{1}{2}$. **11.** By adding down after adding up. **12.** By adding the remainder and the subtrahend to get the minuend. **13.** 2462; 17,448. **14.** 2283; 15,124. **15.** 2201; 14,063. **16.** $47.14. **17.** 85. **18.** 19,140; 140,400. **19.** $629 + 593 + 590 + 608 = 2420$, $2420 \div 4 = 605$. **20.** 11 quarters = 55 nickels, 9 dimes = 18 nickels, $55 + 18 = 73$ (nickels).

Page 177

Aim: To present problems dealing with Yellowstone Park

Suggestions: On pages 45–46 there are problems dealing with Yellowstone Park. With those pages the pupils were encouraged to discover many more things about this great national park. The problems on page 177 deal with one of the great wonders of this park, Old Faithful. The data concerning Old Faithful are authoritative. Any pupils who have witnessed this awe-inspiring sight will gladly relate their impressions of this great gusher of water.

Key: **2.** 68 min. = 1 hr. 8 min., 1 hr. 8 min. after 9:54 A.M. is 11:02 A.M. **3.** 11:02 − 10:46 = 16 (min.). **4.** Add 1 hr. 8 min. to 11:02 A.M., which gives 12:10 P.M. Then add 1 hr. 8 min. to 12:10 P.M., which gives 1:18 P.M., and so on to 2:26 P.M., 3:34 P.M., 4:42 P.M., 5:50 P.M., 6:58 P.M., 8:06 P.M. **5.** 22 × 4 min. = 88 min., 88 min. = 1 hr. 28 min. **6.** 220,000 gal. **7.** 120 ft. + 160 ft. = 280 ft., 280 ft. ÷ 2 = 140 ft.

Pages 178–179

Aim: To give help on the use of 9 as a quotient figure in long division

Suggestion: When Rule I is used to estimate quotient figures, difficulty is sometimes encountered when the correct quotient figure should be 9. This difficulty is fully illustrated in the explanation of the model examples given in ex. 1 and 2.

Workbook Reference: Arithmetic Workshop, Book 5, page 95

Key: Page 178 **3.** 99; 89; 88; 97; 884. **4.** 99; 89; 88; 98; 986.

Page 179 **1.** 9 R5; 99 R23; 96; 951. **2.** 9 R9; 99 R16; 97; 996 R34. **3.** 8 R22; 97; 94; 985 R13. **4.** 8 R28; 88 R17; 94; 833 R19. **5.** 8 R40; 98 R11; 99 R13; 964 R3. **6.** 9 R16; 97 R6; 69; 883 R23. **7.** 9 R22; 89 R9; 98; 969 R41. **8.** 9 R20; 99 R5; 87; 995. **9.** 18 tickets. **10.** 1 hr. 30 min. **11.** $737.50. **12.** $8.00 + $1.50 + $2.25 + $3.00 + $.95 = $15.70. **13.** 1 doz. = 12; 300 ÷ 12 = 25; 25 × $.45 = $11.25.

Page 180

Aim: To review the major aims of Chapter 5

Suggestion: This page reviews all ten major aims listed in this Guide at the beginning of Chapter 5. These are:

Chapter Review	*Aim Number*
Ex. 1, 5–8	2
Ex. 2 and 3	3
Ex. 4	4
Ex. 9–12	6, 7, 8, 9, 10
Ex. 13 and 14	5
Ex. 15 and 16	1

Key: **1.** 368 thousand, 1 hundred, 46; 1 million, 210 thousand, 1 hundred, 46; 10 million, 3 hundred, 60; 410 million, 100 thousand, 50. **2.** 1950; 64; 1865; 764. **3.** 49; 1492; 1776; 1529. **4.** 2 thousands, 3 hundreds, 8 tens, 5 ones; 8 hundreds; 3 thousands; 20 thousands. **5.** 6,000,500. **6.** 12,010,050. **7.** 18,001,004.

8. 523,000,410. **9.** 9 R32, 7 R21; 5 R3; 287; 719. **10.** 5 R2; 8 R8; 20 R38; 208 R2; 708 R24. **11.** 33 R15; 54 R10; 6 R12; 98 R3; 609. **12.** 10 R67; 20 R8; 42 R1; 609 R1; 803 R7. **13.** 20 × 40 = 800 (estimate), 20 × 39 = 780 (exact); 100 + 80 = 180 (estimate), 98 + 79 = 177 (exact); 400 − 100 = 300 (estimate), 395 − 107 = 288 (exact); 1500 ÷ 30 = 50 (estimate), 1495 ÷ 29 = 51 R16 (exact). **14.** 30 × 30 = 900 (estimate), 29 × 31 = 899 (exact); 80 + 90 = 170 (estimate), 83 + 89 = 172 (exact); 700 − 500 = 200 (estimate), 702 − 498 = 204 (exact); 4900 ÷ 70 = 70 (estimate), 4899 ÷ 71 = 69 (exact). **15.** $\frac{7}{8}$; $7\frac{1}{4}$; $4\frac{4}{5}$; $4\frac{1}{4}$; $10\frac{1}{2}$; 10; $13\frac{1}{5}$; 12. **16.** $\frac{1}{4}$; $2\frac{1}{2}$; $2\frac{2}{5}$; $1\frac{1}{2}$; $1\frac{1}{3}$; $5\frac{3}{8}$; $4\frac{3}{5}$; $7\frac{1}{2}$.

Page 181

Aim: To give Problem Test 5

Workbook Reference: Arithmetic Workshop, Book 5, page 83

Key: **1.** 4 × 30 in. = 120 in., 120 ÷ 12 = 10 (ft.). **2.** 10 ft. + 4 ft. + 4 ft. = 18 ft.; 18 × \$.60 = \$10.80. **3.** 13,475¢ ÷ 49¢ = 275 (books). **4.** $82\frac{3}{4}$ lb. − $76\frac{1}{4}$ lb. = $6\frac{1}{2}$ lb. **5.** $2\frac{1}{4}$ hr. + $6\frac{3}{4}$ hr. = 9 hr., 9 × \$.60 = \$5.40. **6.** \$75.90 ÷ 14 = \$5.42 R2¢ or \$5.42. **7.** $4\frac{1}{8}$ yd. + $2\frac{7}{8}$ yd. = 7 yd.; 7 × \$.78 = \$5.46. **8.** (1) 21 buttons + 15 buttons = 36 buttons, 36 ÷ 12 = 3 (doz.); (2) 3 × \$.39 = \$1.17. **9.** 2940 mi. ÷ 12 = 245 mi. **10.** 61 × 23¢ = 1403¢, or \$14.03.

Page 182

Aim: To provide a diagnostic test with page references for practice work

Key: **1.** 2 R6; 1 R35; 3 R11. **2.** 7 R27; 7 R30; 8 R33. **3.** 16 R15; 24 R10; 24 R21. **4.** 78 R27; 56 R13; 45 R18. **5.** 485; 775; 564. **6.** 334 R17; 377 R21; 635 R5. **7.** \$3.15; \$1.31; \$1.36 R10¢. **8.** 8; 9; 7. **9.** 84; 831 R2; 941. **10.** 430; 580 R15; 450 R12. **11.** 605; 507 R9; 308. **12.** 842 R4; 936; 843 R2. **13.** 678; 768 R4; 843. **14.** 929 R19; 992 R16; 837.

Chapter 6

Aims of Chapter 6. The major aims of Chapter 6 are to:

1. Review basic skills taught in previous chapters.
2. Teach the addition of unlike fractions with related denominators.
3. Teach the subtraction of unlike fractions with related denominators.
4. Teach the addition and subtraction of unlike fractions with unrelated denominators.
5. Teach subtraction of a fraction or a mixed number from a whole number.
6. Teach the subtraction of a mixed number from a mixed number.
7. Teach the addition of columns of fractions.
8. Teach carrying and regrouping with fractions.
9. Teach finding a fractional part of a number.
10. Teach multiplication of a whole number by a mixed number.

Pages 183–184

Aim: To provide experiences in cost analysis

Suggestions: Although the problems on this page deal with dogs, the major aim is to introduce pupils to cost accounting. Most children give little thought to the amount an article costs: they either have the money to buy it or they do not. However, with each passing year the child will be presented with more and more economic problems. The fifth grade is a good place to introduce to the pupil the need for determining whether a certain article, or a certain thing, is a good investment of time and money. Naturally, you will not refer to the work on these pages as *cost accounting;* but after the table of costs (problem 4, page 184) has been completed, the pupil will have arrived at some conclusions concerning the varying costs of the different dogs. Some pupils will already have interjected comments concerning their own dogs and the costs of maintaining them. Problems 5 and 6 on page 184 raise the question of profit, and certainly no one engages in a business activity without considering the possibility of making a profit. Some teachers extend these problem situations by showing the pupils how to keep accounts of the cost of feeding their own pets and projecting these costs on a monthly basis. The question then arises, "Can I afford it?" Through problem situations such as these, the child becomes indoctrinated in the need to inquire into costs and decide whether or not his budget can afford those costs.

Workbook Reference: Arithmetic Workshop, Book 5, page 70

Key: Page 183 **1.** $\frac{3}{4}$ lb. + $1\frac{1}{4}$ lb. + $1\frac{3}{4}$ lb. + 2 lb. + $2\frac{1}{4}$ lb. = 8 lb. **2.** (1) 4 × \$6.00 = \$24.00; (2) 4 × 50 lb. = 200 lb.; (3) 200 lb. ÷ 8 lb. = 25 (da.). **3.** \$6.00 ÷ 50 = \$.12.

Page 184 **1.** $\frac{3}{4}$ × 12¢ = 9¢. **2.** 1 lb. costs 12¢, $\frac{1}{4}$ lb. costs 3¢, 12¢ + 3¢ = 15¢ (cost for Jerry); $\frac{3}{4}$ lb. costs 9¢, 12¢ + 9¢ = 21¢ (cost for Spot); 2 × 12¢ = 24¢ (cost for Jack); $\frac{1}{4}$ lb. costs 3¢, 2 lb. cost 24¢, 24¢ + 3¢ = 27¢ (cost for Prince).

3. 7 × 9¢ = 63¢ (cost for Curly); 7 × 15¢ = 105¢ or $1.05 (cost for Jerry); 7 × 21¢ = 147¢ or $1.47 (cost for Spot); 7 × 24¢ = 168¢ or $1.68 (cost for Jack); 7 × 27¢ = 189¢ or $1.89 (cost for Prince).

4.

	Cost of Food per Day	Cost of Food per Week	Care per Week	Total Cost per Week
Curly	$.09	$ .63	$.75	$1.38
Jerry	.15	1.05	.75	1.80
Spot	.21	1.47	.75	2.22
Jack	.24	1.68	.75	2.43
Prince	.27	1.89	.75	2.64
				$10.47

5.

	Cost of Food per Day	Cost of Food per Week	Care per Week	Total Cost per Week
Curly	$.09	$ .63	$1.00	$1.63
Jerry	.15	1.05	1.00	2.05
Spot	.21	1.47	1.00	2.47
Jack	.24	1.68	1.00	2.68
Prince	.27	1.89	1.00	2.89

6. $1.00 − $.75 = $.25, 5 × $.25 = $1.25.

Page 185

Aim: To review fraction skills and multiplication and division of whole numbers

Suggestion: Urge the more advanced pupils to try ex. 1–6 orally.

Key: **2.** $\frac{1}{4}$; $\frac{1}{2}$; $\frac{5}{8}$; $\frac{2}{3}$; $\frac{2}{3}$; $\frac{2}{3}$; $\frac{2}{5}$; $\frac{4}{5}$; $\frac{4}{5}$. **3.** 1; $2\frac{1}{4}$; $3\frac{3}{4}$; $5\frac{2}{3}$; $2\frac{1}{10}$; 4; 5; $6\frac{2}{5}$; $1\frac{1}{12}$. **4.** $1\frac{1}{2}$; $1\frac{1}{4}$; $1\frac{2}{3}$; $11\frac{5}{6}$; $7\frac{1}{8}$; $9\frac{4}{5}$; 10; 13. **5.** $1\frac{2}{5}$; 1; $1\frac{1}{2}$; $5\frac{3}{5}$; $8\frac{1}{2}$; 3; $8\frac{3}{5}$; 11. **6.** $\frac{3}{5}$; $\frac{1}{2}$; $\frac{2}{3}$; $4\frac{3}{4}$; 3; $\frac{4}{5}$; $3\frac{1}{2}$; $5\frac{5}{6}$. **7.** 38; 93; 207 R6; 98 R12. **8.** 240; 72; 509 R7; 310 R7. **9.** 76 R68; 504 R12; 104 R11; 71 R60. **10.** 3320; 120,727; 227,500; 151,292. **11.** 6720; 525,850; 109,005; 317,000. **12.** 2166; 64,855; 378,100; 513,316.

Pages 186–187

Aims: To review the meaning of equal fractions and to show how a fraction can be changed to an equal fraction

Suggestions: Another important principle of fractions is taught on this page; namely, that if both terms of a fraction are multiplied by the same number, the result is another fraction with the same value. This principle and the one taught on page 115 of the text are the two most important principles in the work on common fractions. The work on page 187 should have very careful study, since it will be used in the addition of fractions with unlike denominators.

Workbook Reference: Arithmetic Workshop, Book 5, page 33

Key: **7.** 2; yes. **8.** 2; 4; 8; 6; 8. **9.** 6; 4; 2; 10; 10. **10.** 3; 8; 8; 14; 3. **11.** 8; 2; 12; 12; 12. **12.** 6; 2; 10; 6; 6. **13.** 6; 4; 4; 4; 9. **14.** 3; 4; 8; 4; 2. **15.** 9; 6; 4; 6; 2. **16.** 4; 4.

Page 188

Aim: To show that only like things can be added

Suggestion: This work leads up to the addition of unlike fractions by showing the need for changing the unlike fractions to like fractions before they are added.

Key: **5.** 8 cents + 30 cents = 38 cents; 5 feet + 12 feet = 17 feet; 12 birds; 10 nickels + 8 nickels = 18 nickels or 90 cents. **6.** 3 birds + 2 birds = 5 birds; 2 pints + 5 pints = 7 pints; 6 cents + 75 cents = 81 cents; 60 minutes + 17 minutes = 77 minutes. **7.** 9 hours; 2 animals + 4 animals = 6 animals; 30 pennies + 2 pennies = 32 pennies; 20 quarts + 3 quarts = 23 quarts.

Pages 189–191

Aim: To teach the first work on addition of fractions with unlike denominators

Suggestions: On page 189 the model example and its explanation should have very careful study. Make clear to the pupils that they cannot add *halves* and *fourths* because those fractions have different names; but if they change $\frac{1}{2}$ to $\frac{2}{4}$, they can then add $\frac{2}{4}$ and $\frac{1}{4}$ because the fractions now have the same name. In ex. 2 the term *common denominator* should be fully explained, since it will be used frequently in the subsequent work in fractions. On page 190 the model example should be carefully studied before the pupils begin the work in ex. 4–6. Attention is called to the fact that the denominators in each of the exercises are such that the common denominator is the same as the denominator of one of the fractions. This means that only one of the fractions has to be changed before the fractions can be added.

Key: Page 189 **3.** $\frac{7}{8}$; $\frac{3}{8}$; $\frac{5}{8}$; $\frac{7}{8}$; $\frac{7}{8}$; $\frac{5}{16}$; $\frac{11}{16}$; $\frac{13}{16}$; $\frac{5}{6}$; $\frac{4}{5}$. **4.** $\frac{3}{8}$; $\frac{5}{6}$; $\frac{5}{8}$; $\frac{1}{2}$; $\frac{2}{3}$; $\frac{11}{16}$; $\frac{11}{16}$; $\frac{9}{16}$; $\frac{11}{12}$; $\frac{15}{16}$.

Page 190 **2.** $\frac{1}{2}$ mi. = $\frac{4}{8}$ mi., $\frac{4}{8}$ mi. + $\frac{7}{8}$ mi. = $\frac{11}{8}$ mi. = $1\frac{3}{8}$ mi. **3.** $\frac{1}{2}$ hr. = $\frac{2}{4}$ hr., $\frac{2}{4}$ hr. + $\frac{3}{4}$ hr. = $\frac{5}{4}$ hr. = $1\frac{1}{4}$ hr. **4.** $1\frac{1}{8}$; $1\frac{1}{8}$; $1\frac{1}{12}$; $1\frac{7}{16}$; $1\frac{7}{10}$; $1\frac{3}{4}$; $\frac{13}{16}$. **5.** $1\frac{3}{8}$; $1\frac{1}{2}$; $1\frac{1}{16}$; $1\frac{1}{16}$; $\frac{13}{16}$; $1\frac{1}{10}$; $\frac{15}{16}$. **6.** $1\frac{1}{6}$; $1\frac{1}{3}$; $1\frac{7}{16}$; $1\frac{3}{16}$; $\frac{9}{10}$; $1\frac{3}{10}$; $1\frac{1}{6}$. **7.** $1\frac{1}{4}$ qt. **8.** $1\frac{5}{8}$ cups.

Page 191 **2.** $7\frac{1}{8}$; $7\frac{1}{2}$; $10\frac{1}{6}$; $5\frac{1}{5}$; $8\frac{3}{16}$; $9\frac{1}{3}$; $11\frac{1}{12}$. **3.** $9\frac{5}{6}$; $9\frac{1}{4}$; $9\frac{1}{2}$; $4\frac{1}{16}$; $7\frac{7}{12}$; $6\frac{3}{16}$; $11\frac{3}{16}$. **4.** $6\frac{3}{8}$; $10\frac{1}{3}$; $10\frac{5}{12}$; $7\frac{1}{2}$; $11\frac{3}{16}$; $5\frac{2}{3}$; $9\frac{3}{4}$.

Page 192

Aim: To provide further practice in adding fractions with unlike denominators

Workbook Reference: Arithmetic Workshop, Book 5, pages 53 to 55

Key: **1.** $8\frac{1}{4}$ lb. **2.** $12\frac{1}{2}$ doz. **3.** $4\frac{1}{4}$ in. **4.** $15\frac{1}{4}$ oz. **5.** $7\frac{7}{8}$; $11\frac{1}{2}$; $6\frac{1}{10}$; $3\frac{1}{16}$; $9\frac{13}{16}$; $13\frac{1}{2}$; $9\frac{1}{4}$. **6.** $11\frac{7}{8}$; $9\frac{2}{3}$; $5\frac{5}{12}$; $7\frac{1}{16}$; $13\frac{1}{5}$; $11\frac{1}{6}$; $4\frac{5}{16}$.

Page 193

Aim: To solve problems without questions

Suggestion: Be sure that each pupil is given an opportunity to answer one of the problems. In this way, you may get a good picture of the way your pupils go about solving problems and what problem patterns they use.

Workbook Reference: Arithmetic Workshop, Book 5, page 57

Page 194

Aim: To maintain skill in computing with whole numbers

Workbook Reference: Arithmetic Workshop, Book 5, pages 116 and 117

Key: **1.** 340; 340. **2.** 340; 383. **3.** 312; 319. **4.** 305; 363. **5.** $54.08. **6.** 8202. **7.** 11,296. **8.** 4543; 4614; 2167; 3273; 1407; 1580. **9.** $154.26. **10.** 3623. **11.** 16,821; 103,032; 359,100; 210,691; 152,955; 782,264. **12.** 356,545; 51,597. **13.** 25; 6 R4; 88 R22; 106 R18; 702 R50. **14.** 8 R3; 8 R14; 38; 343 R3; 818 R4. **15.** 75. **16.** $238 + 326 + 195 + 207 + 319 = 1285$, $1285 \div 5 = 257$. **17.** 3, 7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67. **18.** 8, 15, 22, 29, 36, 43, 50, 57, 64, 71.

Pages 195–196

Aim: To introduce the subtraction of fractions with unlike denominators

Suggestions: In the subtraction of fractions, as in the addition of fractions, the fractions must have the same denominators before they can be subtracted. In the exercises on these two pages, the fraction in the minuend is always larger than the fraction in the subtrahend. Fractions in the answers should be changed to lowest terms. In each of the exercises on pages 195 and 196, the common denominator is the same as the denominator of one of the fractions.

Workbook Reference: Arithmetic Workshop, Book 5, pages 59 and 60

Key: Page 195 **2.** $\frac{3}{4}$ hr. $-$ $\frac{2}{4}$ hr. $=$ $\frac{1}{4}$ hr. **3.** $\frac{1}{2}$; $\frac{3}{8}$; $\frac{1}{2}$; $\frac{1}{16}$; $\frac{2}{3}$; $\frac{7}{10}$; $\frac{3}{16}$; $\frac{1}{5}$; $\frac{5}{16}$. **4.** $\frac{1}{8}$; $\frac{3}{8}$; $\frac{1}{6}$; $\frac{1}{10}$; $\frac{5}{16}$; $\frac{1}{4}$; $\frac{3}{16}$; $\frac{7}{12}$; $\frac{9}{16}$. **5.** $\frac{1}{8}$; $\frac{5}{8}$; $\frac{1}{4}$; $\frac{2}{5}$; $\frac{7}{16}$; $\frac{1}{6}$; $\frac{9}{16}$; $\frac{3}{10}$; $\frac{5}{16}$. **6.** $\frac{5}{12}$ is $\frac{1}{12}$ larger than $\frac{4}{12}$.

Page 196 **2.** $5\frac{7}{8}$ yd. $-$ $2\frac{1}{4}$ yd. $=$ $3\frac{5}{8}$ yd. **3.** $5\frac{1}{2}$ hr. $-$ $3\frac{1}{4}$ hr. $=$ $2\frac{1}{4}$ hr. **4.** $2\frac{3}{8}$; $6\frac{1}{6}$; $4\frac{7}{16}$; $2\frac{3}{10}$; $3\frac{1}{16}$; $1\frac{1}{12}$; $1\frac{1}{16}$. **5.** $2\frac{1}{8}$; $2\frac{1}{3}$; $4\frac{7}{12}$; $2\frac{1}{2}$; $1\frac{1}{6}$; $4\frac{5}{16}$; $1\frac{1}{4}$. **6.** $2\frac{1}{4}$; $2\frac{1}{6}$; $4\frac{3}{10}$; $4\frac{1}{16}$; $3\frac{1}{2}$; $3\frac{5}{16}$; $3\frac{3}{16}$. **7.** $6\frac{7}{16}$; $\frac{1}{16}$; $2\frac{9}{16}$; $4\frac{3}{16}$; $3\frac{5}{16}$. **8.** $5\frac{1}{3}$; $6\frac{3}{4}$; $3\frac{1}{2}$; $7\frac{1}{4}$; $2\frac{5}{12}$. **9.** $3\frac{1}{8}$; $2\frac{9}{16}$; $4\frac{3}{8}$; $\frac{3}{16}$; $7\frac{1}{16}$.

Page 197

Aim: To maintain computation skills in whole numbers

Key: **1.** 89; 734 R8; 992; 932. **2.** 140; 639 R10; 575 R32; 602 R2. **3.** 323; 454; 322; 812 R13. **4.** 152; 994 R8; 224; 931. **5.** 61,715; 30,008; 8499; 13,588; 35,005. **6.** 37,728; 22,299; 73,347; 25,664; 36,512. **7.** 133,840; 236,682; 242,896. **8.** 336,440; 98,050; 294,056. **9.** 236,640; 250,900; 952,551. **10.** 135,636; 459,298; 75,855. **11.** 454,779; 329,718; 558,558. **12.** $820.19; $879.80; $913.13; $1400.00; $2207.34. **13.** 400; 9192. **14.** 315; 7200.

Page 198

Aim: To solve problems without numbers

Suggestion: Refer to the instructions in this Guide for teaching page 57.

Key: **1.** Add. **2.** Divide. **3.** Add. **4.** Divide. **5.** Divide. **6.** Multiply; then subtract. **7.** Subtract. **8.** Subtract. **9.** Multiply; multiply. **10.** Add; then divide.

Page 199

Aim: To review basic vocabulary

Suggestions: The words tested on this page are basic to an arithmetic vocabulary for Grade 5. If some pupils cannot recall the correct words (unaided recall), provide small cards (2 inches by 8 inches) on which these vocabulary words are written. As the pupil thumbs through the cards, he will match a word with a statement (aided recall).

Key: **1.** Mixed number. **2.** Subtract. **3.** Change. **4.** Sum. **5.** One fourth. **6.** Distance. **7.** Decimal point. **8.** Dividend, divisor, quotient, remainder. **9.** Numerator, denominator, terms. **10.** Multiplicand, multiplier, product. **11.** Subtrahend, minuend, remainder, difference. **12.** Divide.

Pages 200–201

Aim: To teach how to add and subtract fractions when the common denominator is not the denominator of one of the original fractions

Suggestions: On the preceding pages of this book all the exercises in addition and subtraction of unlike fractions have been such that the denominator of one of the two fractions has been the common denominator; hence, it was necessary to change only one of the fractions before adding or subtracting them. You now come to new work in which the common denominator is not the same as the denominator of either fraction. For example, in adding two fractions such as $\frac{2}{3}$ and $\frac{1}{2}$, the common denominator is neither 3 nor 2. In cases of this kind, the pupil usually finds the common denominator *by inspection;* but if he fails to discover the common denominator readily in this way, *he can always find it by multiplying the two given denominators together.* In work of this kind, both fractions must be changed to fractions with a common denominator before they can be added or subtracted.

Key: Page 201 **1.** $1\frac{1}{6}$; $1\frac{1}{12}$; $2\frac{9}{10}$; $13\frac{2}{15}$; $4\frac{7}{24}$; $7\frac{3}{10}$; $9\frac{7}{12}$; $8\frac{5}{12}$. **2.** $\frac{11}{12}$; $\frac{5}{6}$; $4\frac{7}{12}$; $8\frac{1}{12}$; $9\frac{5}{6}$; $8\frac{1}{6}$; $12\frac{11}{15}$; $12\frac{1}{10}$. **3.** $\frac{7}{10}$; $1\frac{5}{12}$; $5\frac{1}{10}$; $7\frac{7}{10}$; $10\frac{17}{24}$; $11\frac{11}{12}$; $11\frac{1}{10}$; $6\frac{7}{15}$. **5.** $4\frac{1}{6}$ doz. **6.** $\frac{1}{6}$; $\frac{5}{12}$; $2\frac{1}{10}$; $8\frac{1}{12}$; $1\frac{7}{24}$; $3\frac{3}{10}$; $2\frac{1}{12}$; $5\frac{1}{15}$. **7.** $\frac{7}{24}$; $\frac{2}{15}$; $3\frac{1}{15}$; $3\frac{2}{15}$; $3\frac{5}{24}$; $1\frac{1}{24}$; $5\frac{3}{10}$; $2\frac{13}{24}$. **8.** $\frac{1}{6}$; $\frac{13}{24}$; $6\frac{7}{15}$; $1\frac{1}{24}$; $3\frac{5}{24}$; $3\frac{7}{15}$; $5\frac{5}{12}$; $2\frac{13}{24}$.

Page 202

Aim: To review orally basic fraction skills, measures, Roman numerals, and number concepts

Key: **1.** $1\frac{1}{4}$, $1\frac{1}{5}$, $1\frac{1}{8}$, $2\frac{2}{3}$, $3\frac{1}{3}$, $3\frac{2}{5}$, $2\frac{3}{4}$, $2\frac{1}{7}$, $4\frac{1}{6}$. **2.** $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{5}{6}$, $\frac{2}{7}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{3}{4}$. **3.** 47, 76, 90, 32, 58, 23, 71, 39; 48, 77, 91, 33, 59, 24, 72, 40; 50, 79, 93, 35, 61, 26, 74, 42; 51, 80, 94, 36, 62, 27, 75, 43. **4.** 64, 82, 23, 85, 31, 68, 40, 47; 60, 78, 19, 81, 27, 64, 36, 43; 59, 77, 18, 80, 26, 63, 35, 42. **5.** $3\frac{1}{2}$. **6.** $3 \times 15¢ = 45¢$. **7.** $9¢ \div 2 = 4\frac{1}{2}¢$. **8.** 4 pk. = 1 bu., 12 pk. ÷ 4 pk. = 3 bu.; 16 pk. ÷ 4 pk. = 4 bu. **9.** 23, 29, 35, 41, 47, 53, 59, 65, 71, 77, 83, 89; 44, 50, 56, 62, 68, 74, 80, 86. **10.** 32, 41, 50, 59, 68, 77, 86, 95; 113, 122, 131, 140, 149, 158, 167, 176, 185. **11.** 1 nickel, 1 dime, 1 quarter; 2 pennies, 1 nickel, 1 half dollar; 1 dime, 1 quarter, 1 half dollar; 1 penny, 1 dime, 1 half dollar; 2 pennies, 1 nickel, 1 dime, 1 quarter; 3 pennies, 1 quarter, 1 half dollar; 3 pennies, 2 dimes. **12.** 6 zeros. **13.** 7 zeros. **14.** 5 mi.; 20 mi. **15.** 27. **16.** 2000 lb., 1000 lb. **17.** 1 ft. = 12 in.; 2 ft. = 24 in.; 2 ft. 6 in. = 30 in.; 5 ft. = 60 in. **18.** $\frac{2}{3} \times 24 = 16$, $\frac{3}{4} \times 24 = 18$; $\frac{3}{4}$ of 24 is larger. **19.** 64; 1 hundred, 40; 1 thousand, 9 hundred, 50; 1 thousand, 9 hundred, 59.

Page 203

Aim: To teach the subtraction of a fraction from the whole number *1*

Suggestions: This is the first time that the regrouping idea has been introduced in the study of subtraction of fractions. Notice that in the illustrative examples at the top of the page the 1 is changed to $\frac{4}{4}$, $\frac{6}{6}$, and $\frac{8}{8}$, depending on the fraction that is being subtracted. Have the pupils complete the examples in ex. 9 the same way, talking out the work they are doing. Be sure that the fraction in each answer is changed to lowest terms.

Key: **4.** 10, 16, 3, 5, 12, 7. **5.** $\frac{3}{4}$ yd. **6.** $\frac{1}{2}$ apple. **7.** $\frac{1}{3}$ bar. **8.** 3 parts; 2 parts. **9.** $\frac{2}{5}$; $\frac{3}{8}$; $\frac{3}{5}$; $\frac{1}{3}$; $\frac{1}{6}$; $\frac{1}{8}$; $\frac{11}{16}$; $\frac{1}{12}$.

Page 204

Aim: To teach the subtraction of fractions and mixed numbers from whole numbers

Suggestions: This skill is an extension of the one taught on the preceding page. The illustrative example shows how 4 is changed to $3\frac{4}{4}$. This concept is identical with the regrouping idea when a ten is changed to ten ones. Have the pupils indicate that they must regroup 1 from 4 and make it 3, and then change the regrouped 1 to $\frac{4}{4}$, since it is necessary to subtract $\frac{3}{4}$ from it. Encourage the pupils to talk out these examples. Be sure that each whole number in the minuend is properly expressed in its new mixed-number form.

Workbook Reference: Arithmetic Workshop, Book 5, pages 75 and 76

Key: **2.** Yes. **4.** $6\frac{5}{8}$; $8\frac{1}{5}$; $2\frac{1}{3}$; $1\frac{5}{6}$; $3\frac{3}{8}$; $1\frac{5}{16}$; $\frac{3}{10}$. **5.** $5\frac{1}{4}$; $7\frac{1}{6}$; $\frac{4}{5}$; $2\frac{3}{8}$; $1\frac{2}{3}$; $\frac{5}{12}$; $2\frac{13}{16}$. **6.** $8\frac{1}{8}$; $3\frac{2}{5}$; $2\frac{3}{4}$; $\frac{7}{8}$; $1\frac{3}{5}$; $4\frac{7}{16}$; $\frac{1}{12}$.

Page 205

Aim: To solve problems dealing with shopping

Suggestion: The problem situations described on this page are real, and the prices quoted are accurate.

Workbook Reference: Arithmetic Workshop, Book 5, page 89

Key: **1.** \$.85 + \$.43 = \$1.28. **2.** \$2.25 + \$.95 = \$3.20, \$3.20 − \$3.00 = \$.20. **3.** 2 × \$.75 = \$1.50. **4.** \$10.00 − \$6.95 = \$3.05. **5.** \$9.95 − \$7.47 = \$2.48. **6.** \$15.95 − \$11.00 = \$4.95 or 495¢, \$.45 = 45¢; 495¢ ÷ 45¢ = 11 (wk.). **7.** 7:50 A.M. to 8:00 A.M. = 10 min., 8:00 A.M. to 12 M. = 4 hr., 12 M. to 5:25 P.M. = 5 hr. 25 min., 10 min. + 4 hr. + 5 hr. 25 min. = 9 hr. 35 min.

Pages 206–207

Aim: To teach the subtraction of fractions with like denominators when the fraction in the minuend is smaller than the fraction in the subtrahend

Suggestions: The illustrative examples at the top of page 206 (ex. 1 and 3) extend the idea of regrouping in subtraction which was first taught on page 203. Another way to explain that $3\frac{1}{4}$ is the same as $2\frac{5}{4}$ is to suggest that the pupils think in terms of dollars: "Are \$$3\frac{1}{4}$ dollars the same as \$$2\frac{5}{4}$ (5 quarters)? Certainly, when \$1 is changed to quarters!" Ex. 3 on page 206 should be given careful study and class explanation. The first step is to notice that $\frac{7}{8}$ must be taken from $\frac{3}{8}$. Since $\frac{7}{8}$ cannot be taken from $\frac{3}{8}$, 1 must be regrouped from 3 and changed to $\frac{8}{8}$. The $\frac{8}{8}$ is now added to the $\frac{3}{8}$ to get $\frac{11}{8}$. The minuend now reads $2\frac{11}{8}$. It is possible to subtract $\frac{7}{8}$ from $\frac{11}{8}$ and secure the answer $\frac{4}{8}$. Then 1 is subtracted from 2 to get the answer $1\frac{4}{8}$, which equals $1\frac{1}{2}$. Caution the pupils not to short-cut this operation, but to write out the example as in ex. 3. Insist that equal signs be used and that the whole numbers, as well as the fractions, appear in both columns.

Workbook Reference: Arithmetic Workshop, Book 5, page 81

Key: Page 206 **4.** $1\frac{2}{3}$; $4\frac{1}{3}$; $5\frac{3}{4}$; $2\frac{4}{5}$; $2\frac{1}{2}$; $1\frac{2}{3}$; $1\frac{7}{8}$. **5.** $3\frac{1}{2}$; $6\frac{1}{4}$; $2\frac{4}{5}$; $\frac{5}{8}$; $1\frac{5}{6}$; $6\frac{4}{5}$; $\frac{5}{8}$.

Page 207 **1.** $2\frac{1}{3}$ cups − $1\frac{2}{3}$ cups = $\frac{2}{3}$ cup. **2.** $2\frac{3}{16}$ lb. − $1\frac{13}{16}$ lb. = $\frac{6}{16}$ lb. or $\frac{3}{8}$ lb. **3.** $5\frac{1}{4}$ hr. − $1\frac{3}{4}$ hr. = $3\frac{2}{4}$ hr. or $3\frac{1}{2}$ hr. **4.** $2\frac{1}{16}$ lb. − $1\frac{3}{16}$ lb. = $\frac{14}{16}$ lb. or $\frac{7}{8}$ lb. **5.** $10\frac{3}{10}$ mi. − $4\frac{7}{10}$ mi. = $5\frac{6}{10}$ mi. or $5\frac{3}{5}$ mi. **6.** 6 ft. − $4\frac{1}{2}$ ft. = $1\frac{1}{2}$ ft. **7.** $1\frac{1}{2}$; $3\frac{4}{5}$; $1\frac{2}{5}$; $2\frac{5}{8}$; $3\frac{2}{3}$; $\frac{5}{8}$; $2\frac{3}{4}$. **8.** $2\frac{3}{4}$; $7\frac{2}{5}$; $4\frac{1}{2}$; $1\frac{1}{5}$; $4\frac{7}{8}$; $\frac{4}{5}$; $4\frac{7}{8}$. **9.** $\frac{3}{4}$; $5\frac{1}{2}$; $1\frac{7}{8}$; $1\frac{1}{6}$; $3\frac{5}{8}$; $\frac{1}{4}$; $4\frac{2}{5}$. **10.** $4\frac{3}{5}$; $6\frac{3}{4}$; $3\frac{1}{8}$; $2\frac{3}{5}$; $4\frac{3}{4}$; $6\frac{3}{8}$; $3\frac{3}{4}$.

Page 208

Aim: To extend addition of fractions to three addends

Suggestion: No new skills are required to solve these examples. The model examples at the top of the page illustrate the correct procedure for writing the numbers and indicating lowest common denominators.

Key: **3.** $1\frac{2}{8}$ yd. + $\frac{7}{8}$ yd. + $\frac{2}{8}$ yd. = $1\frac{11}{8}$ yd. = $2\frac{3}{8}$ yd. **4.** Yes; $2\frac{1}{2}$ yd. − $2\frac{3}{8}$ yd. = $\frac{1}{8}$ yd. (long). **5.** $\frac{5}{6}$; $\frac{7}{8}$; $9\frac{3}{8}$; $12\frac{2}{5}$; $8\frac{1}{16}$; $6\frac{11}{12}$; $9\frac{5}{16}$; $12\frac{3}{10}$. **6.** 2; $1\frac{1}{2}$; $12\frac{3}{4}$; $5\frac{1}{6}$; $8\frac{2}{3}$; $9\frac{1}{10}$; $4\frac{7}{12}$; $10\frac{3}{16}$.

Page 209

Aims: To present problems containing extra facts and to review basic skills

Suggestions: The solution of problems with extra facts was first introduced on page 68. For that page this Guide explained that this type of problem occurred frequently in daily life. The extra facts must be weeded out before an estimate can be made or an answer can be calculated. The mixed-practice exercises, beginning with ex. 6, serve as a ready review of previously learned skills.

Key: **1.** "33" not needed; 216 ÷ 5 = $43\frac{1}{5}$, or about 43 (candy bars). **2.** "3," "$1\frac{3}{4}$," "$2\frac{1}{2}$," and "$4\frac{1}{4}$" not needed; \$1.40 + \$2.00 + \$3.40 = \$6.80. **3.** "8" not needed; 3 × \$.15 = \$.45. **4.** "63" and "72" not needed; $57\frac{1}{2}$ in. − 53 in. = $4\frac{1}{2}$ in. **5.** "10" and "5" not needed; \$2.90 + \$2.15 = \$5.05. **6.** 5 half dollars = \$2.50, 11 quarters = \$2.75, 19 dimes = \$1.90, 26 nickels = \$1.30, \$2.50 + \$2.75 + \$1.90 + \$1.30 + \$.14 = \$8.59. **7.** $6\frac{8}{12} + 4\frac{6}{12} + 3\frac{7}{12} = 13\frac{21}{12} = 14\frac{9}{12} = 14\frac{3}{4}$. **8.** $5\frac{5}{8}$. **9.** $1\frac{1}{6}$; $3\frac{3}{4}$; $4\frac{2}{3}$; $2\frac{2}{3}$; $2\frac{1}{2}$; $4\frac{4}{5}$. **10.** $\frac{3}{4}$; $\frac{1}{2}$; $\frac{2}{5}$; $\frac{5}{6}$; $\frac{2}{3}$; $\frac{3}{4}$. **11.** XLVI; LXXXIII; XCV; CX; CCL; CDLXXIV; DCCCXXIX; MCCCXXXI; MDCCLXXVI; MCMLVIII. **12.** 1734 + 1806 + 2117 + 2006 + 1967 = 9630, 9630 ÷ 5 = 1926. **13.** $\frac{1}{2} \times \$.88 = \$.44$.

Page 210

Aim: To review the basic skills

Suggestions: Ex. 1–2 are complete, but they all contain errors. Can the pupils determine that the examples are wrong and tell what the error is in each example? This type of exercise may be extended by having pupils check other pupils' papers for ex. 6–8. After the papers have been checked, request that each checker point out specific errors so that the owner of the paper will know *where* the mistake occurs.

Key: **1.**

$$\begin{array}{r} 246 \\ \underline{104} \\ 984 \\ \underline{246} \\ 25584 \end{array} \qquad \begin{array}{r} 560 \\ \underline{382} \\ 1120 \\ 4480 \\ \underline{1680} \\ 213920 \end{array} \qquad \begin{array}{r} 316 \\ \underline{230} \\ 9480 \\ \underline{632} \\ 72680 \end{array} \qquad \begin{array}{r} 728 \\ \underline{209} \\ 6552 \\ \underline{1456} \\ 152152 \end{array}$$

2.

$$\begin{array}{r} 509 \\ 35\overline{)17815} \\ \underline{175} \\ 315 \\ \underline{315} \end{array} \qquad \begin{array}{r} 840 \\ 19\overline{)15960} \\ \underline{152} \\ 76 \\ \underline{76} \\ 0 \end{array} \qquad \begin{array}{r} 563 \\ 43\overline{)24210} \\ \underline{215} \\ 271 \\ \underline{258} \\ 130 \\ \underline{129} \\ 1 \end{array} \qquad \begin{array}{r} 940 \\ 58\overline{)54527} \\ \underline{522} \\ 232 \\ \underline{232} \\ 7 \end{array}$$

3. 6 lb. − $5\frac{11}{16}$ lb. = $\frac{5}{16}$ lb. **4.** 10 × \$.56 = \$5.60, \$5.60 − \$4.76 = \$.84. **5.** $2\frac{6}{8}$ qt. + $2\frac{4}{8}$ qt. + $2\frac{7}{8}$ qt. = $6\frac{17}{8}$ qt. = $8\frac{1}{8}$ qt. **6.** 347; 829 R5; 907; 486 R8. **7.** 943; 805; 676; 587. **8.** 690 R7; 768; 856; 989 R4.

Page 211

Aim: To present cases in which fractions in the quotient should be changed to lowest terms

Suggestions: This work in changing fractions to lowest terms is an extension of the work presented on page 115 of the text. Remind the pupils that in changing a fraction to lowest terms they must divide both terms of the fraction by the same number. Sometimes a pupil finds it easier to change a fraction in several steps. For example, in changing $\frac{48}{72}$ to lowest terms, a pupil might first divide both terms by 2, which would give $\frac{24}{36}$. He could then divide both terms of $\frac{24}{36}$ by 6, which would give $\frac{4}{6}$. Then he could divide both terms of $\frac{4}{6}$ by 2, which would give $\frac{2}{3}$. Remember, however, that the changing of the remainder to lowest terms is infrequently used in higher mathematics. Quotients are usually expressed as whole numbers and decimal fractions (the decimal fraction being carried to as many decimal places as accuracy requires); if a remainder is still evident, a plus sign is used. Many arithmetic teachers allow pupils to express remainders as R — until decimal fractions are introduced.

Workbook Reference: Arithmetic Workshop, Book 5, page 96

Key: **3.** $43\frac{1}{3}$; $46\frac{4}{11}$; $162\frac{22}{29}$; $23\frac{10}{43}$; 145. **4.** $14\frac{6}{23}$; $76\frac{7}{39}$; $49\frac{1}{3}$; $75\frac{1}{7}$; $159\frac{3}{5}$. **5.** $63\frac{1}{2}$; $21\frac{1}{2}$; $64\frac{2}{5}$; $94\frac{2}{9}$; $76\frac{1}{3}$. **6.** 508 mi. ÷ 8 = $63\frac{1}{2}$ mi. **7.** 1350 in. ÷ 36 in. = $37\frac{1}{2}$ (yd.). **8.** 7647 ÷ 12 = $637\frac{1}{4}$ (doz.). **9.** $2\frac{1}{3}$; $6\frac{5}{6}$; $69\frac{7}{8}$; $137\frac{5}{8}$. **10.** $3\frac{1}{9}$; $5\frac{2}{3}$; $68\frac{1}{3}$; $236\frac{2}{3}$.

Pages 212–213

Aim: To present problems dealing with travel in colonial days

Suggestions: Many children have little understanding or appreciation of the difficulties encountered by travelers in colonial times. Travel is so easy today that young people and adults alike fail to be thankful for the many blessings which surround them in the form of the high horse-powered automobile, the streamlined train, and the modern airplane. A distance of 90 miles was a formidable journey in the days of our forefathers, but to the student of today it is a mere after-supper spin. The alert teacher will correlate these problems with map reading and encourage comparisons between travel in 1750 and travel today. Problem 3 introduces data concerning the cost of travel in 1788 and will provide further opportunities for comparisons.

Key: **1.** 90 mi. ÷ 3 = 30 mi. **2.** $\frac{1}{2} \times 3$ da. = $1\frac{1}{2}$ da. **3.** (1) 15 mi. + 13 mi. + 22 mi. + 16 mi. + 37 mi. = 103 mi.; (2) \$1.25 + \$1.24 + \$1.89 + \$1.87 = \$6.25. **4.** (1) 4 days + $1\frac{1}{2}$ days + 15 days + 2 days = $22\frac{1}{2}$ days; (2) \$10.00 + \$5.00 + \$50.00 + \$5.00 = \$70.00.

Pages 214–216

Aim: To provide further practice in subtraction of fractions when regrouping is necessary

Suggestions: The major difference between the examples on these pages and those on page 206 is that these fractions have unlike but related denominators. Therefore it is necessary to find a common denominator. In every case the common denominator is already expressed in either the minuend or the subtrahend. Some pupils will wish to take an intermediate step between writing the example and showing the regrouping procedure. (See the illustrative example at the top of page 214.) For instance:

$$\begin{array}{rcrcr} 50\frac{3}{10} & = & 50\frac{3}{10} & = & 49\frac{13}{10} \\ \underline{46\,\frac{1}{2}} & = & \underline{46\frac{5}{10}} & = & \underline{46\frac{5}{10}} \\ & & & & 3\frac{8}{10} = 3\frac{4}{5} \end{array}$$

Workbook Reference: Arithmetic Workshop, Book 5, pages 77, 78, and 80

Key: Page 214 **2.** $5\frac{1}{4}$ yd. − $2\frac{1}{2}$ yd. = $4\frac{5}{4}$ yd. − $2\frac{2}{4}$ yd. = $2\frac{3}{4}$ yd. **3.** $1\frac{5}{8}$; $3\frac{1}{2}$; $4\frac{15}{16}$; $2\frac{9}{10}$; $\frac{1}{3}$; $\frac{7}{16}$; $3\frac{5}{6}$. **4.** $2\frac{3}{4}$; $\frac{7}{8}$; $\frac{15}{16}$; $1\frac{7}{12}$; $\frac{13}{16}$; $\frac{7}{10}$; $3\frac{3}{4}$. **5.** $5\frac{5}{6}$; $1\frac{5}{8}$; $3\frac{3}{16}$; $1\frac{9}{10}$; $1\frac{5}{6}$; $2\frac{3}{10}$; $5\frac{1}{4}$.

Page 215 **2.** $4\frac{3}{4} = 4\frac{6}{8} = 3\frac{14}{8}$; $3\frac{1}{2} = 3\frac{3}{6} = 2\frac{9}{6}$. **3.** 3, 9; 2, 14; 12, 28. **4.** 6, 14; 5, 15; 4, 14. **5.** 2, 8; 6, 22; 6, 18. **6.** $1\frac{3}{8}$; $6\frac{7}{10}$; $1\frac{15}{16}$; $1\frac{5}{16}$; $2\frac{5}{6}$; $3\frac{7}{12}$; $3\frac{9}{10}$. **7.** $\frac{5}{6}$; $1\frac{15}{16}$; $4\frac{3}{10}$; $\frac{9}{16}$; $3\frac{1}{4}$; $5\frac{9}{16}$; $\frac{3}{4}$. **8.** $4\frac{5}{8}$; $4\frac{2}{3}$; $1\frac{3}{16}$; $4\frac{1}{2}$; $4\frac{7}{16}$; $\frac{9}{10}$; $3\frac{13}{16}$. **9.** $2\frac{7}{8}$; $\frac{13}{16}$; $2\frac{1}{3}$; $2\frac{7}{16}$; $7\frac{15}{16}$; $2\frac{3}{4}$; $3\frac{11}{16}$. **10.** $2\frac{11}{16}$; $5\frac{13}{16}$; $1\frac{15}{16}$; $4\frac{9}{16}$; $\frac{13}{16}$.

Page 216 **1.** $55\frac{1}{2}$ in. − $52\frac{3}{4}$ in. = $2\frac{3}{4}$ in. **2.** $4\frac{1}{2}$ hr. − $3\frac{3}{4}$ hr. = $\frac{3}{4}$ hr. **3.** $1\frac{1}{2}$ lb. = $1\frac{8}{16}$ lb., $1\frac{3}{4}$ lb. = $1\frac{12}{16}$ lb., $1\frac{12}{16}$ lb. − $1\frac{8}{16}$ lb. = $\frac{4}{16}$ lb., $1\frac{8}{16}$ lb. − $1\frac{5}{16}$ lb. = $\frac{3}{16}$ lb.; $1\frac{5}{16}$ lb. is nearer to $1\frac{1}{2}$ lb., or only $\frac{3}{16}$ lb. less. **4.** $7\frac{1}{2}$ mi. − $6\frac{5}{8}$ mi. = $6\frac{12}{8}$ mi. − $6\frac{5}{8}$ mi. = $\frac{7}{8}$ mi. **5.** $2\frac{5}{12}$; $1\frac{5}{6}$; $2\frac{15}{16}$; $\frac{7}{10}$. **6.** $1\frac{13}{16}$; $5\frac{7}{8}$; $1\frac{15}{16}$; $5\frac{11}{12}$. **7.** $1\frac{11}{12}$; $\frac{2}{3}$; $2\frac{11}{16}$; $2\frac{13}{16}$. **8.** $2\frac{5}{6}$; $4\frac{2}{3}$; $4\frac{1}{2}$; $3\frac{3}{4}$. **9.** $2\frac{13}{16}$; $5\frac{1}{2}$; $1\frac{3}{4}$; $2\frac{13}{16}$; $3\frac{5}{8}$; $\frac{9}{16}$; $4\frac{7}{12}$. **10.** $3\frac{7}{16}$; $\frac{9}{10}$; $\frac{3}{5}$; $3\frac{11}{16}$; $6\frac{3}{4}$; $1\frac{9}{16}$; $\frac{3}{4}$. **11.** $4\frac{15}{16}$; $3\frac{9}{16}$; $1\frac{7}{16}$; $\frac{5}{12}$; $2\frac{5}{8}$; $2\frac{15}{16}$; $3\frac{7}{10}$. **12.** $2\frac{5}{6}$; $4\frac{9}{10}$; $\frac{13}{16}$; $1\frac{11}{16}$; $1\frac{7}{8}$; $1\frac{9}{16}$; $2\frac{11}{12}$.

Pages 217–219

Aim: To extend the work on fractional parts, introduced on page 61, to finding fractional parts of larger numbers when the work cannot be done mentally

Suggestions: The finding of a fractional part of a number was first introduced on page 61 of the text, where the work was so easy that it could be done mentally. On page 217 more difficult work in fractional parts is now taken up. Ex. 4 on page 218 is very important, since it shows that the sign × may be used in place of the word "of." Make clear that the sign × *after* a fraction means "of.". The work in finding fractional parts, as given on these pages, is called also the multiplication of a whole number by a fraction. Ex. 12 on page 219 should have careful study. In this exercise it is pointed out that all the work on this page has been such that the whole number could be divided exactly by the denominator of the fraction; hence, each exercise was worked by first dividing the whole number by the denominator and then multiplying the result by the numerator. In short, division was followed by multiplication.

Key: Page 217 **4.** 185; 84; 115; $1.41. **5.** 111; 105; 180; $4.13. **6.** 114; 295; 108; $2.04. **7.** 87; 56; 252; $4.30. **8.** 236; 120; 162; $2.20. **9.** 322; $3.08; $2.17; $1.68; $2.94. **10.** 78; $1.48; $1.10; $1.70; $1.32.

Page 218 **1.** $\frac{3}{4}$ of $9.80 = $7.35. **2.** $\frac{2}{3}$ of $8.85 = $5.90. **3.** $\frac{3}{4}$ of $10.00 = $7.50. **5.** (1) $\frac{3}{4}$ × $25.00 = $18.75; (2) $25.00 − $18.75 = $6.25. **6.** $\frac{2}{3}$ × $30 = $20.

Page 219 **1.** (1) $\frac{3}{4}$ × 60 mi. = 45 mi.; (2) 40 min. = $\frac{40}{60}$ hr. = $\frac{2}{3}$ hr., $\frac{2}{3}$ × 60 mi. = 40 mi. **2.** $\frac{3}{4}$ × 24 = 18 (cups). **3.** (1) $\frac{3}{4}$ × $.68 = $.51; (2) $\frac{3}{4}$ × $.84 = $.63. **4.** $\frac{3}{4}$ × $1.00 = $.75. **5.** $\frac{2}{3}$ × $7.50 = $5.00. **6.** $\frac{7}{8}$ × $.88 = $.77. **7.** 33; 65; 50; $.72; $2.50. **8.** 30; 24; 57; $1.70; $2.00. **9.** 42; 48; 52; $1.86; $1.60. **10.** 35; 40; 60; $.84; $2.32. **11.** 48; 69; 58; $.70; $2.70. **13.** 54; 63; 96; 147; 150; 240. **14.** 21; 36; 45; 105; 180; 300. **15.** 40; 70; 145; 265; 305; 150. **16.** 30; 58; 94; 170; 194; 216.

Page 220

Aim: To teach the multiplication of a whole number by a mixed number

Suggestion: The work of multiplying a whole number by a mixed number is fully explained in ex. 1.

Key: **2.** \$7.67. **3.** \$2.25. **4.** \$4.88. **5.** \$2.43. **6.** 425; 162; 855; \$29.11. **7.** 270; 72; 819; \$9.44. **8.** 189; 286; 427; \$2.80. **9.** 420; 168; 600; \$18.80. **10.** 200; 237; 1887; \$10.83.

Page 221

Aim: To provide a timed test on the four fundamental operations pertaining to whole numbers

Workbook Reference: Arithmetic Workshop, Book 5, page 79

Key: **1.** 17,695; 20,000; 23,658; 22,914; 31,608. **2.** 9790; 9058; 35,998; 35,127. **3.** 14,378; 18,913; 36,828; 19,604. **4.** 5474; 16,895; 6730; 6228. **5.** 129,328; 70,310; 224,480; 243,729; 938,672; 443,812. **6.** 312 R15; 520; 952; 863. **7.** 403; 577 R45; 818; 608 R11.

Page 222

Aim: To review the major aims of Chapter 6

Suggestion: This page reviews all ten major aims listed in this Guide at the beginning of Chapter 6. These are:

Chapter Review	*Aim Number*
Ex. 1	2 and 3
Ex. 2, 3, 5	4
Ex. 4 and 6	5, 6, 8
Ex. 7–10	9 and 10
Ex. 11	4 and 7
Ex. 12	1

Key: **1.** 4, 10; 4, 20; 9, 21. **2.** 6; 12. **3.** 12; 10. **4.** 3; yes. **5.** $1\frac{5}{6}$. **6.** $\frac{5}{8}$; $3\frac{5}{6}$; $3\frac{1}{2}$; $3\frac{5}{8}$; $6\frac{7}{12}$; $3\frac{1}{10}$; $2\frac{13}{16}$. **7.** 63; 42; 60; 110; \$8.85. **8.** 42; 35; 60; 171; \$7.70. **9.** $6\frac{3}{4} \times \$1.16 = \$7.83$. **11.** $4\frac{3}{8}$; $11\frac{1}{2}$; $8\frac{3}{8}$; $15\frac{3}{4}$; $9\frac{15}{16}$; $10\frac{1}{6}$; $10\frac{4}{5}$. **12.** $94\frac{1}{4}$; $76\frac{4}{5}$; $43\frac{3}{11}$; $573\frac{5}{18}$; 406.

Page 223

Aim: To give Problem Test 6

Key: **1.** $87\frac{1}{4}\text{ lb.} - 70\frac{1}{2}\text{ lb.} = 87\frac{1}{4}\text{ lb.} - 70\frac{2}{4}\text{ lb.} = 86\frac{5}{4}\text{ lb.} - 70\frac{2}{4}\text{ lb.} = 16\frac{3}{4}\text{ lb.}$ **2.** $2\frac{3}{5}\text{ sec.} + 1\frac{7}{10}\text{ sec.} + 2\frac{1}{2}\text{ sec.} = 2\frac{6}{10}\text{ sec.} + 1\frac{7}{10}\text{ sec.} + 2\frac{5}{10}\text{ sec.} = 5\frac{18}{10}\text{ sec.} = 6\frac{8}{10}\text{ sec.} = 6\frac{4}{5}\text{ sec.}$ **3.** $2\frac{1}{2} \times \$.70 = \$1.75$, $\$.65 + \$.56 + \$1.75 = \$2.96$, $\$5.00 - \$2.96 = \$2.04$. **4.** $3135\text{ mi.} \div 11 = 285\text{ mi.}$ **5.** $9\text{ ft.} - 6\frac{3}{4}\text{ ft.} = 8\frac{4}{4}\text{ ft.} - 6\frac{3}{4}\text{ ft.} = 2\frac{1}{4}\text{ ft.}$ **6.** $\$18.24 + \$15.38 + \$14.92 + \$16.70 = \$65.24$, $\$65.24 \div 4 = \$16.31$. **7.** $3\frac{1}{2} \times \$.30 = \$1.05$, $2\frac{1}{2} \times \$.50 = \$1.25$, $\$1.05 + \$1.25 = \$2.30$. **8.** (1) $52\text{ yd.} \div 16 = 3\frac{1}{4}\text{ yd.}$; (2) $3\frac{1}{4} \times 36 = 117$ (in.). **9.** $\frac{3}{4} \times \$1.40 = \$1.05$. **10.** $3\frac{3}{4}\text{ mi.} + 2\frac{1}{2}\text{ mi.} + 5\frac{3}{4}\text{ mi.} = 3\frac{3}{4}\text{ mi.} + 2\frac{2}{4}\text{ mi.} + 5\frac{3}{4}\text{ mi.} = 10\frac{8}{4}\text{ mi.} = 12\text{ mi.}$

Page 224

Aim: To provide a diagnostic test with page references

Key: **1.** $7\frac{5}{8}$; 8; $9\frac{11}{16}$; $8\frac{5}{12}$; 12. **2.** 5; 12. **3.** 3; 5. **4.** 10, 22; 6, 22. **5.** $2\frac{1}{3}$; $3\frac{5}{8}$; $2\frac{1}{4}$; $1\frac{3}{16}$; $1\frac{1}{2}$. **6.** $\frac{5}{8}$; $\frac{1}{6}$; $7\frac{3}{10}$; $1\frac{5}{16}$; $1\frac{7}{12}$. **7.** $1\frac{1}{3}$; $1\frac{2}{3}$; $\frac{1}{2}$; $3\frac{1}{5}$; $2\frac{1}{2}$. **8.** $2\frac{3}{8}$; $3\frac{2}{3}$; $3\frac{3}{4}$; $3\frac{11}{16}$; $2\frac{3}{5}$. **9.** 36; 75; \$.60. **10.** 36; 135; \$1.56. **11.** 209; 198; \$23.00.

Chapter 7

Aims of Chapter 7. The major aims of Chapter 7 are to:

1. Review the basic skills taught in previous chapters.
2. Teach the meaning of tenths and hundredths.
3. Extend place value to hundredths.
4. Teach addition and subtraction of decimal fractions with like denominators.
5. Illustrate the ways that decimal fractions are used in daily life.
6. Teach the relationships which exist between common and decimal fractions.

Suggestions for Teaching Decimals. A simple introduction to decimals, limited to the addition and subtraction of 1-place and 2-place decimals, is given on pages 225–238 of the text. This introductory treatment is suitable for the fifth grade and should be given there. Decimals are being used today far more than ever before. In fact, the decimal is gradually replacing the common fraction.

The topic of decimals is a somewhat difficult one for children. The reasons for this difficulty are easily seen. Aside from the use of decimals in connection with our money system, all our decimals arise as a result of measurements, the decimals representing fractional parts of certain units of measure. Unfortunately, however, there is little opportunity to give children experience in making measurements that give decimal results, since measuring instruments in which the units are divided decimally are not generally available. For example, the foot ruler commonly used in the schoolroom is divided into 12 parts rather than into 10 parts. Consequently, with such a ruler one cannot measure decimally. Likewise, the inch on the ordinary ruler is divided into sixteenths rather than into tenths. You should take every opportunity to make decimals as real as possible to the pupils. If the school scale for weighing children has pounds divided into tenths, it can be used as an excellent illustration of the use of decimals. Some dairy scales also have pounds divided into tenths. Your textbook has given special attention to pointing out some important uses of decimals in everyday life. See, for example, pages 233–238 of the text.

Page 225

Aim: To teach the meaning and use of the decimal fraction *tenths* as related to a bicycle cyclometer

Suggestions: A bicycle cyclometer is one of the ways in which children see and use the decimal fraction *tenths.* An automobile speedometer is another, although most automobile speedometers use a black number on a white background for the tenths reading rather than a red number on a white background. Another very common use of the decimal fraction tenth is found on a gasoline pump at a filling station. Here the two uses of tenths are found. Fractions of a gallon are expressed in the decimal fraction tenth, and fractions of a cent are expressed in the common fraction tenth. A fourth use of tenths as a decimal fraction is found on the gauge which measures the amount of fuel oil or kerosene that is delivered to a home. Pupils will suggest other uses. However, before leaving the work of this page, you should provide ample practice in the recognition of the relationship which exists between:

one tenth and .1 and $\frac{1}{10}$
two tenths and .2 and $\frac{2}{10}$
three tenths and .3 and $\frac{3}{10}$

Key: 2. 0012, 1 and 2 tenths; 0013, 1 and 3 tenths; 0014, 1 and 4 tenths.

Pages 226–227

Aims: To understand the meaning of the word *hundredths* and to use the terms *common fraction* and *decimal fraction*

Suggestions: All decimal fractions may be written as common fractions, but usually the common fractions are in the form of unchanged fractions. When pupils start to change these common fractions, explain to them that *it is easier* to see the relationship which exists between common and decimal fractions if the denominators of the common fractions are left as 10, 100, and so on. This relationship is shown in ex. 5 on page 226.

At this time, you may plan a review of place value. Show the pupils that decimal fractions are an extension of place value to the right of the decimal point, and that the same tens relationship exists to the right of the decimal point as it does to the left of the decimal point. The only difference is that this tens relationship applies to the denominator (the name) of the fraction rather than to the numerator. The fraction $\frac{1}{10}$ is 10 times larger than $\frac{1}{100}$. The fraction $\frac{1}{100}$ is ten times larger than the next decimal place. Ask the pupils to tell you what the name of the next decimal fraction will be. Ex. 7 on page 227 discusses a *mixed decimal*, the shortened form for the term *mixed decimal fraction*. Pupils will readily understand this term if the numbers in ex. 9–11 are written as both decimal fractions and common fractions; for instance, $1.8 = 1\frac{8}{10}$. $1\frac{8}{10}$ is a mixed number; 1.8 is a mixed decimal.

Key: 2. $\frac{5}{6}$. **5.** Thousandths. **6.** Five and nine tenths; eight and nine hundredths. **9.** Three tenths, five tenths, one and eight tenths, forty-six hundredths, thirty-two hundredths, four and seventy-two hundredths, three dollars and fifty-seven cents. **10.** Eight tenths, one tenth, four and nine tenths, thirty-five hundredths, seventy-four hundredths, one and thirty-seven hundredths, four dollars and sixty-eight cents. **11.** Six tenths, seven tenths, three and one tenth, eighty-nine hundredths, sixty-five hundredths, eight and twenty-three hundredths, one dollar and twenty-five cents.

Pages 228–229

Aim: To provide practice in reading and writing decimal fractions

Suggestions: These pages stress the close relationship which exists between common and decimal fractions. Pupils must realize that *any common fraction can be* *written as a decimal fraction.* At this time, you may well tell the history of common and decimal fractions. The common fraction has been used by scholars for many centuries. The Babylonians, around 2500 B.C., used a common fraction with the fixed denominator 60. At a later date, around 500 B.C., the Egyptians used a unit fraction in which the numerator 1 was used with varied denominators. Then the common or vulgar fraction that we use today was introduced. It was not until the late sixteenth century that a Belgian businessman by the name of Simon Stevin invented the decimal fraction. His reasoning was simple: if the world is using a decimal number system, a system based on tens, then why not have a way of expressing fractional numbers in a system based on tens? Why have denominators of every conceivable number when it is possible to write fractional numbers with denominators of 10, 100, 1000, and so on? If such a system were possible, then the line separating the numerator and the denominator could be eliminated and the denominator would not have to be written each time. In dealing with whole numbers, people did not write out 3 hundreds, 4 tens, and 6 ones; they wrote the number as 346, since the place the number occupied revealed its place value and its actual value. The same system, Stevin argued, could be used to express fractional amounts. So he invented a way of writing fractional amounts in decimal form. The decimal fraction is a far easier way of writing fractions than the more cumbersome common-fraction form, and it is much easier to manipulate. Today the manipulation of the common fraction is almost nonexistent in the business world. All calculations by machine (comptometer, calculating machine, and so on) are made with the decimal form of the fraction; and textbooks are placing less and less emphasis on learning how to add, subtract, multiply, and divide fractions by the ancient and cumbersome common-fraction method. Pages 228–229 show the pupil how to convert common fractions to decimal fractions so that if calculation of the common fraction is necessary, the more advanced pupil can make the conversion to the decimal form of the fraction and begin calculation at once. The invention of the decimal fraction by Simon Stevin opened an entire new world of mathematics and allowed mathematicians to invent the slide rule, logarithms, and the statistical table. The present-day mechanical brain and electric calculators are made possible by the invention of the decimal fraction.

Workbook Reference: Arithmetic Workshop, Book 5, page 99

Key: Page 228 **1.** 100 blocks; $\frac{1}{100}$ or .01; $\frac{8}{100}$ or .08; $\frac{25}{100}$ or .25; $\frac{10}{100}$ or .10; $\frac{56}{100}$ or .56. **2.** 10 rows; $\frac{1}{10}$ or .1; yes; yes. **3.** four and 5 tenths, seventy-five hundredths, forty-eight hundredths, four tenths, thirty-eight and seven tenths, two and no hundredths. **4.** .7; .59; .6; 5.03; 18.8; 37.27. **5.** .5; .67; .1; 9.01; 43.9; 14.86. **6.** $\frac{5}{10}$; $\frac{24}{100}$; $18\frac{3}{10}$; $4\frac{75}{100}$; $9\frac{8}{100}$; $15\frac{7}{10}$. **7.** $\frac{2}{10}$; $\frac{63}{100}$; $12\frac{6}{10}$; $8\frac{39}{100}$; $4\frac{60}{100}$; $34\frac{8}{10}$. **8.** 655.4. **9.** 815.46. **10.** 437.09.

Page 229 **1.** 20 blocks, $\frac{1}{10}$ or .1. **3.** 5 parts, .2. **6.** .2; .1; .44; .7; .74; .65; .58; .9. **7.** .6, .14; .88; .45; .94; .55; .68; .38. **8.** .5; .72; .35; .26; .84; .3; .64; .95. **9.** .25; .96; .82; .76; .15; .24; .66; .92.

Page 230

Aim: To present addition and subtraction of decimals in which all the decimals are tenths

Suggestion: In adding and subtracting the decimals in ex. 3–6 on page 230 and on the following pages, the pupils must write the decimal point in the sum directly under the decimal points in the numbers.

Workbook Reference: Arithmetic Workshop, Book 5, pages 100 and 101

Key: **3.** 8.8; 7.2; 111.8; 115.9; 50.2; 334.2. **4.** 9.2; 9.6; 166.7; 60.8; 71.7; 1043.6. **5.** 10.8; 5.5; 77.7; 128.4; 120.4; 895.9. **6.** 1.6, 1.4, 47.6, 8.9, 13.8, 44.8; 1.6, 3.8, 13.3, 0.4, 19.9, 466.0; 1.8, 3.7, 28.1, 50.8, 23.2, 564.1.

Page 231

Aim: To present problems using decimal fractions

Suggestions: These problem situations indicate some ways in which people use decimal fractions in everyday living. Although the decimalized ruler or yardstick (ex. 3 and 7) is not common, it can be bought. Butterfat (ex. 8) is usually measured in decimals, as is mileage (ex. 2, 5, 6). Stop watches (ex. 1) and clinical thermometers (ex. 4) were among the early implements showing decimal fractions. Ask the pupils to suggest other uses of decimal fractions.

Key: **1.** 42.5 sec. − 39.8 sec. = 2.7 sec. **2.** 5.6 mi. + 8.4 mi. + 12.7 mi. = 26.7 mi. **3.** 14.3 ft. − 9.8 ft. = 4.5 ft. **4.** 102.3° − 98.6° = 3.7°. **5.** 21.1 mi. − 16.4 mi. = 4.7 mi. **6.** 763.6 mi. + 847.5 mi. + 663.4 mi. + 472.9 mi. = 2747.4 mi. **7.** 10.4 ft. − 3.7 ft. = 6.7 ft. **8.** (1) 52.6 lb. + 48.6 lb. + 51.3 lb. = 152.5 lb. (what Polly gave); 51.3 lb. + 47.5 lb. + 50.8 lb. = 149.6 lb. (what Brownie gave); (2) 152.5 lb. − 149.6 lb. = 2.9 lb.

Page 232

Aim: To give more work on addition of decimals in which the decimals are tenths

Key: **1.** 3.5 mi. + 4.2 mi. + 5.1 mi. = 12.8 mi. **2.** 3.5 mi. + 1.5 mi. = 5.0 mi. **3.** 12.8 mi. − 5.0 mi. = 7.8 mi. **4.** 5.1 mi. − 3.5 mi. = 1.6 mi. **5.** 13.4; 14.3; 111.6; 84.5; 270.2; 786.2. **6.** 15.2; 11.3; 89.2; 110.8; 266.4; 1237.3.

Page 233

Aim: To give more work on subtraction of decimals in which the decimals are tenths

Key: **2.** 514.6 mi. **3.** (1) 7910.6 mi. − 7824.0 mi. = 86.6 mi.; (2) 8031.4 mi. − 7910.6 mi. = 120.8 mi. **4.** 8031.4 mi. + 147.8 mi. = 8179.2 mi. **5.** 8181.6 mi. − 8179.2 mi. = 2.4 mi.; Mr. Hall probably rode around in the town. **6.** 1441.7; 1308.5; 2256.9; 209.2; 2630.1. **7.** 967.3; 938.0; 2975.4; 686.3; 2143.3. **8.** 3697.4; 1587.5; 472.4; 986.3; 4867.9.

Pages 234–236

Aims: To show how rainfall is measured to hundredths of an inch and to extend the addition and subtraction of decimals to hundredths place

Suggestions: On most rulers the inch is divided into 16 parts; hence, the smallest space represents $\frac{1}{16}$ in. On some rulers the inch is divided into 32 parts, and the smallest space is $\frac{1}{32}$ in. Ask the pupils to try to imagine an inch divided into 100 equal parts, each small part being $\frac{1}{100}$ in. The drawing in ex. 2 on page 234 will give them some idea of how small $\frac{1}{100}$ in. is. In fact, $\frac{1}{100}$ in. is smaller than is shown in ex. 2 because the picture is somewhat enlarged.

The Weather Bureau measures rainfall in hundredths of an inch. This measurement is made on a special instrument called a rain gauge, which is illustrated on page 236. If there is a Weather Bureau in your city, you might plan a class visit to see the instrument that measures rainfall. The daily weather report in many city newspapers gives the number of inches of rain that fell the previous day in the more prominent cities of the United States. In these reports the amount of rainfall is always given in hundredths of an inch. The problems on these pages offer an opportunity for correlation with science and social studies.

Workbook Reference: Arithmetic Workshop, Book 5, pages 102 and 103

Key: Pages 234–235 **3.** 10, 20, 70. **4.** 100; yes. **6.** 90.25 in. − 11.48 in. = 78.77 in. **7.** 1.12 in. + .81 in. + .24 in. + .21 in. + .56 in. + 1.33 in. = 4.27 in. **8.** 20.51 in. − 14.54 in. = 5.97 in. **9.** 42.03 in. − 35.81 in. = 6.22 in. **10.** 9.55 in. − 3.97 in. = 5.58 in.

Page 236 **2.** .92 in. + .78 in. = 1.70 in. **3.** 42.41 in. − 40.58 in. = 1.83 in. **4.** .47; 9.54; 5.02; 79.65; 85.29; 432.62. **5.** 1.21; 13.92; 1.47; 70.16; 81.94; 801.16. **6.** .26; 3.69; 2.54; 15.47; 21.28; 81.50. **7.** .38; 5.69; 3.38; 24.47; 7.75; 198.55.

Page 237

Aim: To provide practice in adding and subtracting decimal fractions (tenths and hundredths)

Key: **1.** 1.1 mi. + 0.8 mi. + 2.2 mi. + 1.8 mi. = 5.9 mi. **2.** 5.9 mi. + 5.9 mi. = 11.8 mi. **3.** (1) 0.8 mi. + 2.2 mi. = 3.0 mi.; (2) 1.1 mi. + 0.8 mi. = 1.9 mi.; (3) 0.8 mi. + 2.2 mi. + 1.8 mi. = 4.8 mi. **4.** 28.67; 624.1. **5.** 17.56; 575.2. **6.** 203.0; 153.46. **7.** 17.4; 99.3; 158.2; 16.03; 17.35; 14.94. **8.** 14.0; 68.0; 159.6; 13.59; 3.82; 12.62. **9.** 1.5; 17.9; 9.9; 3.70; 2.89; .38. **10.** 2.2; 9.0; 47.0; 1.52; 1.68; .28. **11.** 4.8; 19.8; 8.3; .48; 3.57; 2.69.

Page 238

Aim: To show the use of decimal fractions in a railroad timetable

Suggestions: Many teachers will supplement this lesson with real railroad timetables which can be obtained from local railroad lines. If there are no local lines in your community, you might secure timetables from the nearest railroad. Pupils will find that mileage is expressed in tenths of a mile and that time is written with a colon to separate hours from minutes. The children should become proficient at reading timetables. The more advanced pupils may well raise the question as to why time is not decimalized. Alert teachers will send pupils out into the community to determine whether some industrial clock faces are marked in decimal parts. A modern industry which uses a time clock for employees will have such a clock. Instead of being divided into minutes, the hours are divided into *hundredths of an hour.* Let us suppose the time clock shows that a man has worked 42.63 hours during the week. His wage is set at \$1.53 per hour. The bookkeeper, by means of an automatic calculating machine, can readily compute the salary of the employee as 42.63 × \$1.53 = \$65.2239 or \$65.22. Imagine, however, the difficulty if the time clock indicated that the employee worked 42 hours and 38 minutes at \$1.53 per hour. The bookkeeper would have to convert the hours and minutes to hours and fractions of an hour and then calculate. In an industry with hundreds of employees, bookkeeping costs and time are greatly cut down by the use of the decimalized clock. However, in daily life, the hour is still divided into sixty minutes. This division goes back into antiquity to the time that the Babylonians had fractions with constant denominators of 60. The work on this page, however, is planned to help pupils realize that by subtracting mileages and times they can compute the distance they will travel and the time the journey will take.

Key: **1.** (1) 291.7 mi.; (2) 87.8 mi. − 41.1 mi. = 46.6 mi.; (3) 128.5 mi. − 87.7 mi. = 40.8 mi.; (4) 185.1 mi. − 87.7 mi. = 97.4 mi.; (5) 185.1 mi. − 128.5 mi. = 56.6 mi.; (6) 291.7 mi. − 185.1 mi. = 106.6 mi. **2.** 291.7 mi. + 291.7 mi. = 583.4 mi. **3.** (1) 11:34 A.M.; (2) from 5:10 A.M. to 11:34 A.M. is 6 hr. 24 min. **4.** (1) 8:10 A.M. to 2:52 P.M. is 6 hr. 42 min.; (2) 1:34 P.M. to 8:31 P.M. is 6 hr. 57 min.; (3) 7:25 P.M. to 2:47 A.M. is 7 hr. 22 min.; (4) the first train is the fastest. **5.** (1) 2 hr. 8 min., 2 hr. 12 min., 2 hr. 14 min., 2 hr. 19 min.; (2) 4 hr. 54 min., 5 hr. 4 min., 5 hr. 14 min., 5 hr. 39 min.

Page 239

Aim: To review basic skills in whole numbers

Workbook Reference: Arithmetic Workshop, Book 5, page 112

Key: **1.** 508,177; 87,380; 163,510; 159,620. **2.** 497,025; 397,091; 682,992; 396,924. **3.** 82,880; 782,400; 475,800; 237,017. **4.** \$1248.75. **5.** \$360.00. **6.** 527; 489; 746 R10; 947. **7.** 697; 782; 834; 844 R26. **8.** 687 R5; 620 R25; 716; 364. **9.** 739 R35; 867; 503; 348. **10.** \$.15. **11.** 1536; 11,215. **12.** 2226; 20,024. **13.** 1570; 15,448. **14.** 2183; 15,420. **15.** 3927; 17,672; 18,059; 34,256; 8507. **16.** 16,476; 3991; 26,313; 44,798; 8129. **17.** \$.85 + \$1.07 + \$.55 + \$.24 + \$.72 = \$3.43, \$5.00 − \$3.43 = \$1.57.

Pages 240–241

Aim: To present problems dealing with trade in the eighteenth century

Suggestions: On pages 212–213 the class solved problems dealing with colonial travel. The problems on pages 240–241 originated on the frontier and have close associations with current television programs. Since Walt Disney has made Frontierland and Davy Crockett well known to every child, pupils will enjoy solving these problems. Encourage the pupils to compare present-day trade, clothing, and so on with similar aspects of other times. From such comparisons should come a deep appreciation for the great country in which we live and the countless sacrifices of our forefathers. Pupils need, from time to time, to think about their heritage and to count the many blessings which we as Americans receive from these United States. *American Arithmetics* make a consistent effort to guide pupils and teachers into activities which will extend beyond the confines of arithmetic.

Key: **1.** 144 bu. ÷ 6 = 24 bu. **2.** New York State. **3.** $6\frac{1}{2} \times 8$ bu. = 52 bu. **4.** 200 lb. ÷ 3 = $66\frac{2}{3}$ lb. **5.** 3 + 10 + 18 = 31 (shillings). **6.** 31 − 10 = 21 (shillings), value of fox skins, 21 ÷ 3 = 7 (fox skins). **7.** 18 × 46 = 828 (shillings). **8.** (1) 3 × 6 = 18 (shillings), 3 × 1 = 3 (shillings), 18 + 3 = 21 (shillings); (2) 21 ÷ 3 = 7 (yd.). **9.** 3 shillings = the cost of 3 raccoon skins, 6 × 3 = 18 (raccoon skins).

Page 242

Aim: To review basic skills in common-fraction calculation

Key: **1.** $9\frac{1}{2}$; $8\frac{1}{6}$; $7\frac{1}{4}$; $11\frac{5}{6}$; $14\frac{1}{12}$; 9; $10\frac{3}{4}$. **2.** 6; $4\frac{1}{12}$; $8\frac{1}{3}$; $4\frac{1}{4}$; $5\frac{5}{12}$; $9\frac{5}{6}$; $7\frac{1}{2}$. **3.** $6\frac{3}{4}$; $10\frac{1}{3}$; $8\frac{7}{8}$; $5\frac{1}{5}$; $8\frac{3}{16}$; $5\frac{5}{6}$; $5\frac{11}{12}$. **4.** $3\frac{3}{4}$ mi. + $\frac{3}{4}$ mi. = $3\frac{6}{4}$ mi. = $4\frac{2}{4}$ mi. = $4\frac{1}{2}$ mi. **5.** 5; $6\frac{5}{8}$; $11\frac{1}{6}$; $11\frac{7}{16}$; $4\frac{1}{3}$; $9\frac{4}{5}$; $13\frac{5}{12}$. **6.** $5\frac{1}{4}$; $4\frac{2}{5}$; $5\frac{11}{12}$; $\frac{13}{16}$; $6\frac{2}{3}$; $1\frac{3}{5}$. **7.** $5\frac{1}{4}$; $3\frac{9}{16}$; $8\frac{5}{16}$; $2\frac{11}{16}$; $6\frac{1}{16}$; $1\frac{3}{4}$. **8.** $1\frac{1}{5}$; $3\frac{3}{10}$; $1\frac{4}{5}$; $\frac{1}{10}$; $5\frac{1}{10}$; $\frac{1}{5}$. **9.** 15 yd. − $6\frac{5}{8}$ yd. = $14\frac{8}{8}$ yd. − $6\frac{5}{8}$ yd. = $8\frac{3}{8}$ yd. **10.** $2\frac{1}{2}$; $3\frac{1}{4}$; $5\frac{1}{6}$; $3\frac{1}{12}$; $4\frac{9}{16}$; $\frac{13}{16}$; $1\frac{3}{4}$. **11.** $4\frac{1}{3}$; $4\frac{3}{4}$; $1\frac{5}{8}$; $3\frac{4}{5}$; $3\frac{1}{3}$; $2\frac{1}{6}$; $3\frac{3}{5}$. **12.** 15; 12; 15; 84; $7.60. **13.** 24; 6; 42; 88; $4.42. **14.** 40; 84; 87; 77; $3.04. **15.** 24; 54; 56; 50; $4.40.

Page 243

Aim: To provide a mixed review of addition, subtraction, multiplication, and division of whole numbers

Key: **1.** 1385; 16; 75; 174,406. **2.** 120,888; 655; 19; 129,722. **3.** 564; 1003; 27; 72,300. **4.** 421,200; 475; 496; 389,298. **5.** 5225 mi. ÷ 19 = 275 mi. **6.** 175 × $2.98 = $521.50. **7.** 46,250; 12,012; 250,518; 488,028; 313,831; 216,932. **8.** 25,175; 45,297; 400,060; 38,809; 57,420; 71,882. **9.** $38.25 ÷ 45 = $.85. **10.** (1) $9.00 ÷ $.75 = 12 (wk.); (2) $15.00 ÷ $.75 = 20 (wk.); (3) $27.00 ÷ $.75 = 36 (wk.). **11.** $84\frac{23}{36}$; 175; 96; $181\frac{1}{3}$; 265. **12.** 128; $109\frac{5}{13}$; 38; $84\frac{9}{28}$; 508. **13.** $280\frac{5}{33}$; 94; 174; $94\frac{12}{35}$; 850. **14.** $172\frac{16}{55}$; 46; $88\frac{3}{5}$; 73; 730.

Pages 244–247

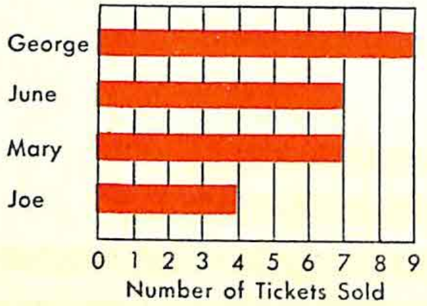
Aim: To introduce simple work on reading and making bar graphs

Suggestions: The work on bar graphs on these pages has been most carefully graded as to difficulty. On page 244 each space on the scale represents 1. On page 245 each space on the scale represents 10, whereas on page 246 each space represents 100. On page 245 great care must be taken in reading the bars in ex. 2, where each bar ends in the middle of a space. In ex. 4 the work is a little more difficult. In drawing bars to represent 58 and 62, the pupil must approximate the length. Each bar in the graph on page 246 has at the left a number which tells how many tickets were sold. The question then arises, "Why do we draw the bars and take the trouble to make them the proper length when the numbers are already there?" The reason for drawing these bars is to show a comparison of the numbers of tickets sold by the various schools. By looking at the first bar, one can easily see that the East School sold the smallest number of tickets; the Page School did a little better than the East School; and the Camp School did still better. The Cliff School did best of all. Bar graphs are drawn primarily to make quick comparisons of numbers. If you had merely the numbers and no bars, the comparison would not be so apparent. On page 247 pupils are given an opportunity to draw bar graphs with different scales.

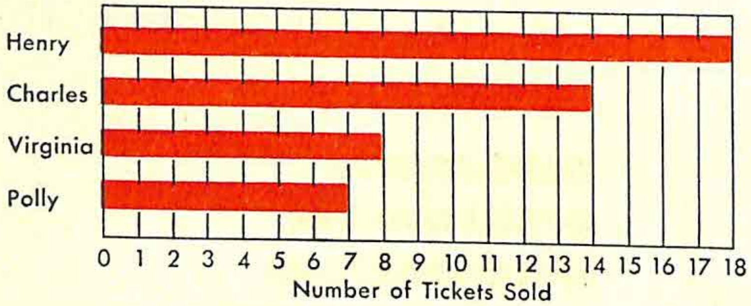
Workbook Reference: Arithmetic Workshop, Book 5, pages 93 and 94

Key: Page 244 **2.** Jane, 11 tickets; Mary, 10 tickets; Bill, 9 tickets; Jack, 7 tickets. **3.** Bob; Bob, 12 tickets; Joe, 10 tickets; Ann, 10 tickets; Jean, 9 tickets.

4.

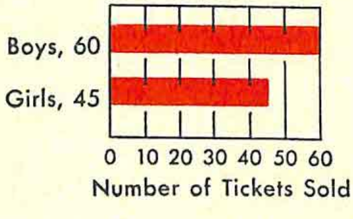


5.

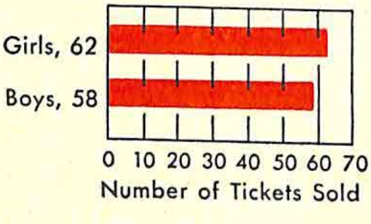


Page 245 **1.** 6 spaces.

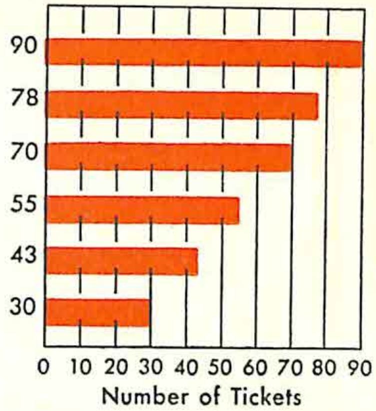
3.



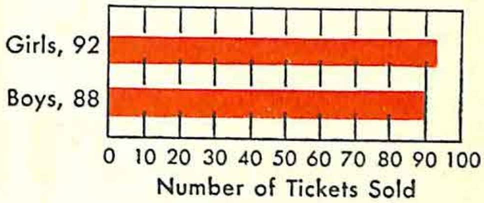
4.



5.

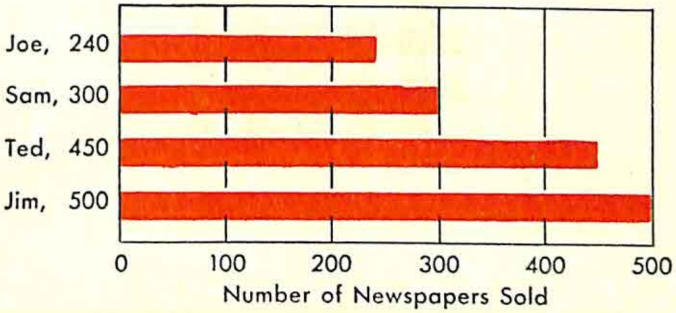


6.

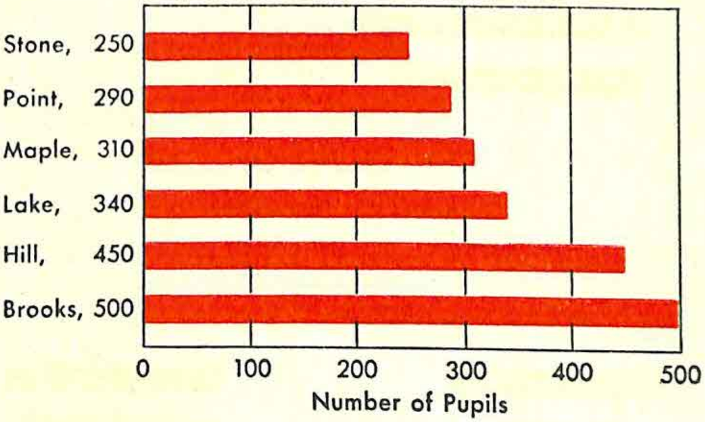


Page 246 **2.** The bar for York School.

3.

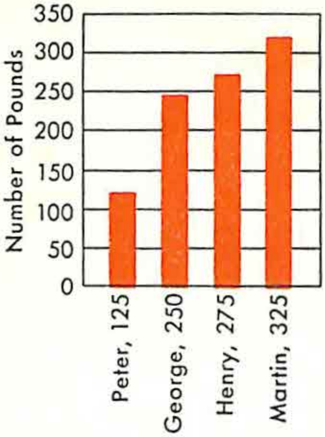


4.



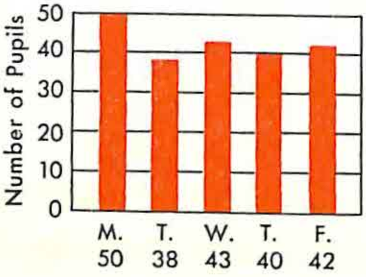
Page 247 **1.** Jim, 200 lb.; Bill, 250 lb.; Don, 300 lb.; Ted, 325 lb. **2.** 50; 25; 125; by making the bar $3\frac{1}{2}$ spaces long.

3.



4. 0, 25, 50, 75, 100, 125, 150, 175, 200, 225, 250.

5.



Page 248

Aim: To provide an oral review

Key: **1.** 430, 310, 240, 500, 620, 740, 830, 900; 860, 620, 480, 1000, 1240, 1480, 1660, 1800; 4300, 3100, 2400, 5000, 6200, 7400, 8300, 9000. **2.** 81, 33, 44, 19, 52, 60, 87, 65; 77, 29, 40, 15, 48, 56, 83, 61; 76, 28, 39, 14, 47, 55, 82, 60. **3.** 23, 29, 68, 47, 62, 84, 56, 31; 24, 30, 69, 48, 63, 85, 57, 32; 25, 31, 70, 49, 64, 86, 58, 33; 35, 41, 80, 59, 74, 96, 68, 43. **4.** 124, 220, 80, 100, 42, $8\frac{1}{2}$, $12\frac{1}{2}$; 62, 110, 40, 50, 21, $4\frac{1}{4}$, $6\frac{1}{4}$. **5.** $1\frac{3}{4}$, $3\frac{1}{3}$, $3\frac{1}{4}$, $4\frac{1}{6}$, $6\frac{2}{3}$, $2\frac{2}{5}$, $1\frac{7}{8}$, $1\frac{1}{2}$, $7\frac{1}{2}$. **6.** $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{2}{3}$, $\frac{4}{5}$, $\frac{4}{5}$, $\frac{3}{4}$, $\frac{4}{5}$. **7.** 25 min. **8.** $30 \div 12 = 2\frac{1}{2}$ (doz.). **9.** $\frac{3}{4} \times 88¢ = 66¢$. **10.** $6 = \frac{1}{2}$ doz.; $\frac{1}{2} \times \$6.00 = \$3.00$. **11.** 1 ft. = 12 in.; 12 in. + 6 in. = 18 in. **12.** 400, 760, 1959, 1101. **13.** 56, 57, 58, 59, 60, 65, 75, 1 dollar; 19, 20, 25, 50, 1 dollar; 83, 84, 85, 90, 1 dollar; 45, 50, 1 dollar; 60, 65, 75, 1 dollar; 38, 39, 40, 50, 1 dollar. **14.** 1 lb. = 16 oz.; 16 oz. + 5 oz. = 21 oz. **15.** 30, 4, 18. **16.** 18, 45, 8. **17.** 2, 8, 48.

Page 249

Aim: To present magic squares with fractional rather than whole numbers

Suggestions: The work on this page is for the more advanced pupils. Those who have enjoyed magic squares on the other pages will enjoy these magic squares also.

Key: **2.** Yes; sum is $2\frac{1}{16}$. **3.** Yes; sum is $1\frac{1}{2}$. **4.** Yes; sum is $1\frac{1}{4}$. **5.** Yes; sum is 1.65. **6.** Yes; sum is 1.74. **7.** Yes; sum is 3.06.

Page 250

Aim: To present a problem review

Key: **1.** $2\frac{1}{4} \times 48$¢ = 108¢ or \$1.08, \$1.08 + \$.19 = \$1.27. **2.** 63 lb. + 75 lb. + 67 lb. + 73 lb. = 278 lb., 278 lb. ÷ 4 = $69\frac{2}{4}$ lb. = $69\frac{1}{2}$ lb. **3.** $2\frac{3}{16}$ lb. + $3\frac{1}{8}$ lb. + $4\frac{1}{4}$ lb. = $2\frac{3}{16}$ lb. + $3\frac{2}{16}$ lb. + $4\frac{4}{16}$ lb. = $9\frac{9}{16}$ lb. **4.** 1 doz. = 12, 12 × 7¢ = 84¢, 84¢ − 75¢ = 9¢. **5.** 522 mi. ÷ 36 mi. = $14\frac{18}{36}$ (hr.) = $14\frac{1}{2}$ (hr.). **6.** (1) $2\frac{1}{4} \times 60$¢ = 135¢ = \$1.35; (2) $3\frac{3}{4} \times 60$¢ = 225¢ = \$2.25; (3) 1 hr. 15 min. = $1\frac{1}{4}$ hr., $1\frac{1}{4} \times 60$¢ = 75¢. **7.** \$16.00 ÷ 32 = \$.50, \$.75 − \$.50 = \$.25. **8.** 15.5 mi. − 8.3 mi. = 7.2 mi. **9.** \$12.96 ÷ 4 = \$3.24, \$3.24 − \$2.60 = \$.64. **10.** $1\frac{1}{2}$ cups + $2\frac{1}{4}$ cups = $1\frac{2}{4}$ cups + $2\frac{1}{4}$ cups = $3\frac{3}{4}$ cups, $5\frac{1}{2}$ cups − $3\frac{3}{4}$ cups = $5\frac{2}{4}$ cups − $3\frac{3}{4}$ cups = $4\frac{6}{4}$ cups − $3\frac{3}{4}$ cups = $1\frac{3}{4}$ cups; yes.

Page 251

Aim: To test basic understandings

Key: **1.** 45. **2.** 900. **3.** 150. **4.** 12, 3; 40, 10. **5.** $\frac{60}{15}$. **6.** $\frac{15}{60}$. **7.** 15; 60. **8.** 4. **9.** 16; 20; 30; 44; 100; 160. **10.** 25; 45; 65; 80; 100. **11.** 2,025,903; 8.7; .15. **12.** 53; 74 R9; 81. **13.** 431,256; 132,328; 197,540; 377,468. **14.** 4895; 6000; 9742; 5896. **15.** 2753; 5378; 4104. **16.** \$1328.25. **17.** \$1.98. **18.** \$112.25. **19.** 18.6 mi. **20.** $10\frac{5}{8}$. **21.** $6\frac{1}{4}$ yd. − $2\frac{7}{8}$ yd. = $6\frac{2}{8}$ yd. − $2\frac{7}{8}$ yd. = $5\frac{10}{8}$ yd. − $2\frac{7}{8}$ yd. = $3\frac{3}{8}$ yd. **22.** .85; .37; .09; .3; .7.

Page 252

Aim: To review the skill in estimating and the understanding of vocabulary

Key: **1.** \$1.00; \$6.95 + \$1.95 = \$8.90, \$10.00 − \$8.90 = \$1.10. **2.** 300 mi.; 885 mi. ÷ 3 = 295 mi. **3.** \$400; 206 × \$1.95 = \$401.70. **4.** \$6.00; \$.96 + \$1.05 + \$1.95 + \$2.10 = \$6.06. **5.** \$50; \$249.10 − \$199.50 = \$49.60. **6.** \$18.00; 6 × \$2.95 = \$17.70.

Page 253

Aim: To have pupils take a timed test

Key: **1.** 100,933; 125,274; 111,560; 97,202. **2.** 271,254; 51,336; 220,012; 144,439. **3.** 19,736; 37,085; 895; 10,645. **4.** 5828; 79,859; 20,088; 1244. **5.** 27,874; 11,376; 6968; 30,909. **6.** 414,450; 644,809; 621,760; 98,895; 117,827. **7.** 636; 495; 697; 750 R3. **8.** 482 R15; 609; 275 R11; 813.

Page 254

Aim: To review some of the major aims of Chapter 7

Suggestion: This page reviews four of the six major aims listed in this Guide at the beginning of Chapter 7. These are:

Chapter Review	*Aim Number*
Ex. 1	2
Ex. 2 and 3	6
Ex. 4–6	4
Ex. 7–12	4 and 5

Key: **1.** Two and five tenths, eleven and six tenths, twenty-one and no tenths, seven tenths, five and nine hundredths, sixteen and thirty hundredths. **2.** .7; .39; .09; 7.9; 8.31; 4.07. **3.** $\frac{6}{10}$; $15\frac{3}{10}$; $\frac{63}{100}$; $4\frac{19}{100}$; $1\frac{4}{100}$; $5\frac{7}{100}$. **4.** 55.3; 10.95. **5.** 54.2; 14.53. **6.** .24; 36.7; 49.5. **7.** 83.2 lb. − 81.6 lb. = 1.6 lb. **8.** 8.4 in. + 5.7 in. = 14.1 in. **9.** 9824.9 mi. − 4287.6 mi. = 5537.3 mi. **10.** 100.5 mi. − 78.2 mi. = 22.3 mi. **11.** 3.4 in. + 6.8 in. = 10.2 in. **12.** 5.4 mi. + 2.5 mi. + 4.0 mi. + 7.2 mi. + 5.5 mi. = 24.6 mi.

Page 255

Aim: To present Problem Test 7

Workbook Reference: Arithmetic Workshop, Book 5, page 97

Key: **1.** 83.2 lb. − 78.5 lb. = 4.7 lb. **2.** $2\frac{1}{2}$ × \$.60 = \$1.50. **3.** \$6.84 ÷ 24 = \$.28$\frac{1}{2}$ or 28$\frac{1}{2}$¢. **4.** 50 min. **5.** \$13.50 = 1350¢, 1350¢ ÷ 75¢ = 18 (birdhouses). **6.** $2\frac{1}{2}$ × \$.62 = \$1.55, $3\frac{3}{4}$ × \$.52 = \$1.95, \$1.55 + \$1.95 = \$3.50. **7.** $2\frac{3}{8}$ yd. + $\frac{1}{2}$ yd. + $1\frac{3}{4}$ yd. = $2\frac{3}{8}$ yd. + $\frac{4}{8}$ yd. + $1\frac{6}{8}$ yd. = $4\frac{5}{8}$ yd. **8.** 6.5 mi. + 4.8 mi. + 4.4 mi. = 15.7 mi. **9.** 3 × \$.44 = \$1.32, \$1.32 + \$.43 = \$1.75. **10.** 8:53 A.M. to 1:17 P.M. is 4 hr. 24 min., 5:10 P.M. to 9:09 P.M. is 3 hr. 59 min., 4 hr. 24 min. − 3 hr. 59 min. = 25 min.

Page 256

Aim: To provide a diagnostic test with page references

Key: **1.** 11.6; 38.1; 152.8; 222.7; 303.3. **2.** 1.73; 2.85; 20.83; 15.65; 21.07. **3.** 3.5; 10.5; 1.8; 17.5; 42.6. **4.** .27; 2.48; 1.90; 2.77; 3.54. **5.** 314.7. **6.** 506.11. **7.** 47.08. **8.** $\frac{9}{10}$; $\frac{3}{10}$; $1\frac{7}{10}$; $11\frac{5}{10}$; $8\frac{1}{10}$. **9.** $\frac{33}{100}$; $\frac{7}{100}$; $2\frac{19}{100}$; $1\frac{47}{100}$; $3\frac{3}{100}$. **10.** .3; .9; 1.7; 2.5; 4.1. **11.** .07; .19; 2.03; 4.46; 2.76.

Chapter 8

Aims of Chapter 8. The major aims of Chapter 8 are to:

1. Review the skills taught in the previous chapters.
2. Provide the following work for schools that require the teaching of this information in Grade 5:
    - a. Reteach meaning of square, rectangle, right angle
    - b. Teach meaning of square inch, square foot, square yard, and acre
    - c. Teach computation of perimeter and area of squares and rectangles
    - d. Present scale drawings and show what the scale of a map means
3. Provide end-of-year tests on skills retaught and taught in Grade 5.

If you are not required to teach geometric figures and square measure in Grade 5, the class may omit pages 260–262, 265–269, and 272–276. The end-of-year tests beginning on page 286, however, are very important; and adequate time should be reserved for their completion.

Pages 257–259

Aim: To present problems dealing with the Grand Canyon

Suggestions: These problems follow quite naturally the problems dealing with Yellowstone Park on pages 45–46 and 177. Once again the pupil is made to realize the extent to which arithmetic is used in everyday life. The facts used in these problems are authentic. Pupils who have visited the Grand Canyon will add much to this interesting class activity by recounting their experiences and impressions of this magnificent spectacle.

Key: Page 257 **1.** 4 mi. + 18 mi. = 22 mi., 22 mi. ÷ 2 = 11 mi. **2.** 5500 ft. − 4400 ft. = 1100 ft. **3.** About 900 years, or 9 centuries. **5.** About $\frac{4}{5}$ million people.

Pages 258–259 **1.** 7.8 mi. + 7.8 mi. = 15.6 mi. **2.** 28 mi. ÷ 10 mi. = $2\frac{8}{10}$, or about 3 times. **3.** 2 tons = 4000 lb., 4000 lb. ÷ 30 = $133\frac{1}{3}$ lb. **4.** 3500 lb. ÷ 7 = 500 lb.; $133\frac{1}{3}$ lb. + 500 lb. = $633\frac{1}{3}$ lb. **5.** 63° + 20° = 83°; 95° − 20° = 75°. **6.** $\frac{3}{5}$ × 5280 ft. = 3168 ft. **7.** 600 ÷ 7 = $85\frac{5}{7}$, or about 86 (wk.). **8.** (1) 1955 − 1867 = 88 (yr.); (2) 50,000 − 7000 = 43,000 (Indians); (3) 43,000 ÷ 88 = 488 R56, or 500 (Indians). **9.** 1 hr. = 60 min., 60 ÷ 45 = $1\frac{1}{3}$ (min.). **10.** 79,974 is about 80,000, 814,130 is about 800,000; 80,000 ÷ 800,000 = $\frac{1}{10}$. **11.** 500,000 tons; 24 × 1,000,000 = 24,000,000 (tons in one da.); 27,600,000 tons is more than a million tons an hour.

Page 260

Aim: To reteach the meaning of angle, right angle, square, and rectangle

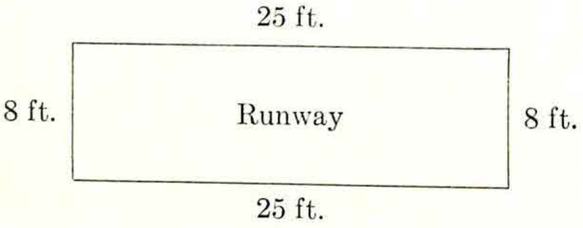
Suggestions: *American Arithmetic, Grade 4* developed the concepts of square and rectangle on pages 246–247. At that time the right angle was also discussed. Notice in problem 2 on page 260 the reference to a checkerboard, and in problem 3 the reference to the schoolroom door. Ask the pupils to list other classroom objects which are either square or rectangular in shape. Emphasize the fact that a square is a very special rectangle with four equal sides.

Key: **1.** A and C. **2.** 32 black squares, 32 red squares. **3.** Yes, the top and the bottom and the two sides; yes; yes.

Pages 261–262

Aim: To learn how to compute the perimeter

Suggestions: If you are keeping a class vocabulary chart of arithmetic terms, place the word *perimeter* on it. Otherwise, write the word on the board. Relate the word to many figures in the classroom, such as your desk, the pupils' desks, an arithmetic book, a pane of glass, the classroom itself. Stress the fact that *perimeter is distance* and can be measured by a ruler, a yardstick, or a tape measure. Now extend this idea of perimeter to a section of the schoolyard and then to problems 2–4 on page 261, and problems 1–8 on page 262. Instruct the pupils to draw a picture for each problem so that they can visualize the rectangle or square. Have them label the length of each side. For instance, in problem 2, page 261, have them draw a picture like this one:



Continue this approach in ex. 9–11 on page 262.

Key: Page 261 **2.** 8 ft. + 25 ft. + 8 ft. + 25 ft. = 66 ft. **3.** 42 ft. + 56 ft. + 42 ft. + 56 ft. = 196 ft. **4.** 40 ft. + 60 ft. + 40 ft. + 60 ft. = 200 ft.

Page 262 **1.** 90 ft. + 90 ft. + 90 ft. + 90 ft. = 360 ft. **2.** 60 ft. + 60 ft. + 60 ft. + 60 ft. = 240 ft. **3.** 12 in. + 18 in. + 12 in. + 18 in. + 3 in. = 63 in. **4.** 15 in. + 15 in. + 15 in. + 15 in. + 3 in. = 63 in. **5.** (1) 6 × 63 in. = 378 in. (for the place mats), 6 × 63 in. = 378 in. (for the napkins), 378 in. + 378 in. = 756 in., 756 in. ÷ 36 in. = 21 (yd.); (2) 21 × 15¢ = 315¢ = $3.15. **6.** 12 ft. + 6 ft. + 12 ft. + 6 ft. = 36 ft. **7.** 236 ft. + 425 ft. + 236 ft. + 425 ft. = 1322 ft. **8.** 1322 ft. is about $\frac{1}{4}$ mi. **9.** 20 ft. + 32 ft. + 20 ft. + 32 ft. = 104 ft.; 17.5 in. + 24.3 in. + 17.5 in. + 24.3 in. = 83.6 in.; 6 yd. + 9 yd. + 6 yd. + 9 yd. = 30 yd. **10.** 52 yd. + 52 yd. + 52 yd. + 52 yd. = 208 yd.; .87 mi. + 1.32 mi. + .87 mi. + 1.32 mi. = 4.38 mi.; 3 yd. = 9 ft., 8 ft. + 9 ft. + 8 ft. + 9 ft. = 34 ft. **11.** 30 in. + 48 in. + 30 in. + 48 in. = 156 in.; 12.5 ft. + 15.6 ft. + 12.5 ft. + 15.6 ft. = 56.2 ft.; 2 yd. = 6 ft., 4 ft. + 6 ft. + 4 ft. + 6 ft. = 20 ft.

Page 263

Aim: To present problems dealing with gift boxes

Suggestions: This problem situation is typical of America in general. We as a nation are willing to share our prosperity with people everywhere. The Junior Red Cross has done much to help school children send gift boxes around the world. Has your school sent any gift boxes this year? If not, you may wish to send some before the school year comes to a close.

Workbook Reference: Arithmetic Workshop, Book 5, page 39

Key: **1.** Grade 3, \$20; Grade 4, \$25; Grade 5, \$25; Grade 6, \$35. Grade 6 earned the most; Grades 4 and 5 earned the same amount. \$20 + \$25 + \$25 + \$35 = \$105. **2.** \$105 ÷ 35 = \$3. **3.** \$105 ÷ \$5 = 21 (boxes). **4.** \$.75 + \$.50 + \$.70 + \$.20 + \$.45 + \$.25 = \$2.85; 35 × \$2.85 = \$99.75, yes.

Page 264

Aim: To review measures

Suggestions: Have ex. 1–6 done orally. Encourage the pupils to complete as many of the other problems as they can without using pencil and paper. Suggest that they place an "M" in front of each answer they computed mentally.

Key: **1.** 40; 5; 30. **2.** 45; 1; 15. **3.** 3; 5; $\frac{1}{2}$. **4.** 90; 2; $\frac{1}{4}$. **5.** 18; 1; $\frac{1}{2}$. **6.** 5; 5; $\frac{1}{2}$. **7.** 20 oz. = $1\frac{1}{4}$ lb.; $1\frac{1}{4}$ × \$.60 = \$.75. **8.** 5¢ ÷ 2 = $2\frac{1}{2}$¢, 17¢ ÷ 6 = $2\frac{5}{6}$¢, $2\frac{5}{6}$¢ − $2\frac{1}{2}$¢ = $2\frac{5}{6}$¢ − $2\frac{3}{6}$¢ = $\frac{2}{6}$¢ = $\frac{1}{3}$¢, 6-ounce bar costs more. **10.** 366 days. **11.** 100; 20th century. **12.** 28 × 350 lb. = 9800 lb., 5 tons = 10,000 lb., yes. **13.** 10,000 lb. ÷ 50 lb. = 200 (boxes). **14.** 50 min. + 30 min. + 35 min. + 45 min. + 40 min. + 70 min. = 270 min., 270 min. ÷ 60 min. = $4\frac{1}{2}$ (hr.). **15.** 6 × 880 ft. = 5280 ft., 1 mi. = 5280 ft.; yes. **16.** The pint or the quart in liquid measure and dry measure.

Page 265

Aim: To introduce the meaning of area as applied to squares and rectangles

Suggestions: The concept of area is a difficult one for pupils to grasp. In studying these pages, the pupils should draw rectangles of various sizes and divide them into square inches. For example, have the pupils draw a rectangle 5 in. long and 3 in. wide. Show them how to divide this rectangle into square inches. Then have them count the number of square inches in the rectangle to find the area. The pupils should be made familiar with such terms as *right angle*, *rectangle*, *square*, and *area*. Ask the pupils to look around the room and find as many rectangles and right angles as possible. Doors, windows, the blackboard, book covers, and so on are good examples of the many things they will find.

Workbook Reference: Arithmetic Workshop, Book 5, page 109

Key: **2.** 4 ft. × 3 ft. = 12 sq. ft. **5.** 4 in. × 4 in. = 16 sq. in.

Pages 266–268

Aim: To find the areas of rectangles and to develop the formula for finding these areas

Suggestions: The study of squares and rectangles on page 265 has prepared the pupils for the rule for finding the area of a rectangle, which is to multiply its length by its width. See ex. 2 on page 267. Emphasize the fact that both the length and the width of the rectangle must be given in the same unit of measure. When the dimensions are given in feet, the area will be in square feet; when the dimensions are given in inches, the area will be in square inches. The pupil should memorize the formula $A = lw$ and learn how to substitute numerical values in it. Emphasize the fact that when two letters like l and w are written *side by side*, they are to be *multiplied*. When a letter is written beside a numeral, or several letters are written together, multiplication is indicated. Thus $3a$ means $3 \times a$ and abc means $a \times b \times c$. In ex. 1 on page 268, the square yard is defined. To acquaint the pupils with this unit of measure, draw a square yard on a large sheet of paper or on the blackboard, as suggested in ex. 2. Ex. 3 shows how to find the area of a rectangle in square yards.

Key: Page 266 **2.** 12 ft. × 9 ft. = 108 sq. ft.; 12 sq. ft; 9 rows.

Page 267 **1.** 10 ft. × 12 ft. = 120 sq. ft. **4.** 11 ft. × 13 ft. = 143 sq. ft. **5.** (1) 6 ft. × 8 ft. = 48 sq. ft., 5 ft. × 10 ft. = 50 sq. ft., 50 sq. ft. − 48 sq. ft. = 2 sq. ft., Bill's garden has the larger area; (2) 2 sq. ft. larger. **6.** (1) 12 ft. × 14 ft. = 168 sq. ft.; (2) yes. **7.** 24 sq. ft.; 130 sq. ft.; 228 sq. ft. **8.** 48 sq. ft.; 180 sq. ft.; 504 sq. ft.

Page 268 **3.** 4 yd. × 5 yd. = 20 sq. yd., 20 × $1.95 = $39.00. **4.** (1) 1 yd. × 36 yd. = 36 sq. yd., 36 × $2.50 = $90.00; (2) 36 × $3.75 = $135.00. **5.** 6 yd. × 8 yd. = 48 sq. yd., 48 × $1.85 = $88.80. **6.** 3458 sq. mi. is about 3000 sq. mi., 1008 sq. mi. is about 1000 sq. mi., 3000 ÷ 1000 = 3 (times). **7.** 20 sq. yd.; 176 sq. yd.; 21 sq. ft. **8.** 56 sq. yd.; 204 sq. yd.; 36 sq. ft. **9.** 64 sq. yd.; 256 sq. yd.; 75 sq. mi.

Page 269

Aim: To present work on both perimeters and areas

Suggestions: The meaning of the word *perimeter* is explained in ex. 1 on page 261. Both dimensions of a rectangle must be expressed in the same unit before the perimeter can be found. If the dimensions are given in feet, the perimeter will be found in feet. In ex. 2 on page 269, the pupil is acquainted with the short way of writing 4 ft., which is 4′, and the short way of writing 6 in., which is 6″.

Key: **1.** (1) 4 ft. + 7 ft. + 4 ft. + 7 ft. = 22 ft.; (2) 6 in. + 9 in. + 6 in. + 9 in. = 30 in. **2.** (1) 10′ + 14′ + 10′ + 14′ = 48′; (2) 11″ + 18″ + 11″ + 18″ = 58″. **3.** (1) 24 ft. × 18 ft. = 432 sq. ft., 22 ft. × 20 ft. = 440 sq. ft., 440 sq. ft. − 432 sq. ft. = 8 sq. ft., Joe's garden has the larger area by 8 sq. ft.; (2) 24 ft. + 18 ft. + 24 ft. + 18 ft. = 84 ft., 22 ft. + 20 ft. + 22 ft. + 20 ft. = 84 ft. **4.** (1) 40′ + 42′ + 40′ + 42′ = 164′; (2) 35′ + 47′ + 35′ + 47′ = 164′, yes; (3) 30′ + 52′ + 30′ + 52′ = 164′, yes; (4) 41′ + 41′ + 41′ + 41′ = 164′, yes. **5.** (1) 40′ × 42′ = 1680 sq. ft., 35′ × 47′ = 1645 sq. ft., 30′ × 52′ = 1560 sq. ft., 41′ × 41′ = 1681 sq.

ft.; therefore, the largest area is contained in the yard 41′ × 41′; (2) square. **6.** 9′ × 12′ = 108 sq. ft., 12′ × 15′ = 180 sq. ft., 180 sq. ft. − 108 sq. ft. = 72 sq. ft. **7.** 108 × \$.65 = \$70.20. **8.** $8\frac{1}{2}$ ft. × 120 ft. = 1020 sq. ft. **9.** (1) 10 in. + 15 in. + 10 in. + 15 in. = 50 in., (2) 10 in. × 15 in. = 150 sq. in.; (1) 9′ + 14′ + 9′ + 14′ = 46′, (2) 9′ × 14′ = 126 sq. ft.; (1) 7′ + 12′ + 7′ + 12′ = 38′, (2) 7′ × 12′ = 84 sq. ft. **10.** (1) 11 ft. + 18 ft. + 11 ft. + 18 ft. = 58 ft., (2) 11 ft. × 18 ft. = 198 sq. ft.; (1) 7′ + 16′ + 7′ + 16′ = 46′, (2) 7′ × 16′ = 112 sq. ft.; (1) 4″ + 10″ + 4″ + 10″ = 28″, (2) 4″ × 10″ = 40 sq. in. **11.** (1) 14 yd. + 16 yd. + 14 yd. + 16 yd. = 60 yd., (2) 14 yd. × 16 yd. = 224 sq. yd.; (1) 5″ + 11″ + 5″ + 11″ = 32″, (2) 5″ × 11″ = 55 sq. in.; (1) 6″ + 15″ + 6″ + 15″ = 42″, 6″ × 15″ = 90 sq. in. **12.** (1) 13 ft. + 20 ft. + 13 ft. + 20 ft. = 66 ft., (2) 13 ft. × 20 ft. = 260 sq. ft.; (1) 6″ + 10″ + 6″ + 10″ = 32″, (2) 6″ × 10″ = 60 sq. in.; (1) 3′ + 11′ + 3′ + 11′ = 28′, (2) 3′ × 11′ = 33 sq. ft.

Page 270

Aim: To provide a practice page of examples dealing with the four fundamental operations as related to common fractions, decimal fractions, and whole numbers

Key: **1.** $8\frac{2}{3}$; 12; $9\frac{3}{4}$; $13\frac{2}{3}$; $4\frac{3}{8}$; $8\frac{1}{6}$; $8\frac{3}{16}$. **2.** 2125; 2000; 2415; 130.4; 97.9; 16.75; 16.09. **3.** $3\frac{1}{2}$; $3\frac{2}{5}$; $5\frac{1}{4}$; $3\frac{1}{4}$; $2\frac{5}{8}$; $3\frac{1}{2}$; $3\frac{9}{16}$. **4.** 45; 213; 3; 39.5; 18.1; .97; 2.28. **5.** 18; 18; 38; 282. **6.** 18; 49; 49; 115. **7.** 25; 85; 120; 105. **8.** 15; 27; 34; 33. **9.** 15; $10\frac{3}{4}$; 72; 864. **10.** 38; 27; $70\frac{1}{2}$; $658\frac{2}{7}$. **11.** $59\frac{1}{2}$; 21; 309; 909. **12.** 172,320; 55,165; 236,160; 233,050. **13.** 697,161; 196,268; 159,165; 264,364. **14.** 443,940; 400,500; 118,668; 126,764.

Page 271

Aim: To present problems with missing facts and problems without numbers

Suggestions: The pupils are well aware of the challenge of solving problems without numbers, since they have encountered many similar exercises in this book. However, problems with missing facts have not been taught as such up to this time. In this Guide, under instructions for teaching page 68, a summary of the problem skills taught to date in *American Arithmetics* is discussed. Five separate types of word problems are listed. Word problems with missing facts compose the sixth type. These five problems should be worked as a class activity. Develop more problems like these if you feel it necessary to do so.

Key: **6.** Divide the cost by the number of children. **7.** Subtract the amount you spent from the amount you had. **8.** Multiply the cost of 1 ticket by the number of children. **9.** Add the five weights and divide by 5. **10.** Add the different numbers.

Pages 272–274

Aims: To show the relation of square yards to square feet and of square feet to square inches and to develop the table of square measure

Suggestions: To show that there are 9 sq. ft. in 1 sq. yd., you should draw a square yard on the blackboard and divide it into square feet, as suggested in ex. 1 on page 272. Ex. 4 and 5 on page 272 need careful attention, since they show how to change an area expressed in square feet to square yards. Ex. 1 on page 273 shows that a square foot contains 144 sq. in. If any pupil can draw carefully, have him draw a square foot on a large sheet of paper and divide the square foot into square inches. In ex. 4 on page 273, notice that the width and the length of the box are given in inches and feet, and both measurements must be changed to inches before the area of the bottom of the box can be found. Remind the pupils that if an area must be given in terms of square inches, the dimensions must both be given in inches. Ex. 5 on page 273 is another reminder that the dimensions must both be given in the same unit of measure before the area can be found. Ex. 6–8 on this page require the pupils to change the dimensions to the same unit of measure before they attempt to find the areas. The table of square measure is given in ex. 1 on page 274. The exercises on the preceding pages have made full preparation for this table. Since the acre is such a common unit for measuring large fields and farms, the pupils should be given some notion of the size of an acre. An approximate acre can be marked off by measuring on the school playground a large square that is 209 ft. on each side. To measure a distance of 209 ft., the pupils can use a piece of string 20 ft. long. Naturally, such a square will represent crude measurement; but it will give an approximate notion of the size of an acre. Precise measurement in a case of this kind is out of the question and should not be expected. The pupils might be interested also in finding the total number of acres in the school playground. If you find such crude measurement impractical, the school janitor can probably tell you the playground area in acres.

Workbook Reference: Arithmetic Workshop, Book 5, pages 110 and 111

Key: Page 272 **1.** 9 sq. ft. **2.** 9 × 11 = 99 (sq. yd.). **3.** 12 × 18 = 216 (sq. ft.). **4.** 216 ÷ 9 = 24 (sq. yd.). **5.** 4 × 6 = 24 (sq. yd.); yes. **6.** 10 yd. = 30 ft., 15 yd. = 45 ft., 30 × 45 = 1350 (sq. ft.); 10 × 15 = 150 (sq. yd.), 9 × 150 = 1350 (sq. ft.); yes. **7.** 27; 2. **8.** 81; 6. **9.** 18; 3. **10.** 72; 4. **11.** 45; 8.

Page 273 **1.** 144 sq. in. **2.** 288 sq. in. **3.** 8 × 11 = 88 (sq. in.); less than 1 sq. ft.; $\frac{1}{2}$ sq. ft. = 72 sq. in., more than $\frac{1}{2}$ sq. ft. **4.** 8 × 14 = 112 (sq. in.). **5.** (1) 3 ft. = 1 yd., 1 × 20 = 20 (sq. yd.); (2) 20 × \$3.25 = \$65.00. **6.** 3 ft. = 1 yd., 1 × 7 = 7 (sq. yd.), 7 yd. = 21 ft., 3 × 21 = 63 (sq. ft.); 1 ft. 4 in. = 16 in., 6 × 16 = 96 (sq. in.). **7.** 8 in. = $\frac{2}{3}$ ft., $\frac{2}{3} \times 2 = \frac{4}{3} = 1\frac{1}{3}$ (sq. ft.), 2 ft. = 24 in., 8 × 24 = 192 (sq. in.); 2 yd. 1 ft. = 7 ft., 4 × 7 = 28 (sq. ft.). **8.** 1 ft. = $\frac{1}{3}$ yd., $\frac{1}{3} \times 1 = \frac{1}{3}$ (sq. yd.), 1 yd. = 3 ft., 1 × 3 = 3 (sq. ft.); 1 ft. = 12 in., 2 ft. 1 in. = 25 in., 12 × 25 = 300 (sq. in.).

Page 274 **2.** 43,560 sq. ft.; 87,120 sq. ft. **3.** 120 × 363 = 43,560 (sq. ft.); yes. **4.** (1) $\frac{1}{4} \times 43{,}560 = 10{,}890$ (sq. ft.); (2) $\frac{1}{2} \times 43{,}560 = 21{,}780$ (sq. ft.); (3) $\frac{3}{4} \times 43{,}560 = 32{,}670$ (sq. ft.); (4) $1\frac{1}{2} \times 43{,}560 = 65{,}340$ (sq. ft.); (5) 54,450 (sq. ft.). **5.** 220 × 297 = 65,340 (sq. ft.); $1\frac{1}{2}$ A. **6.** 90 × 121 = 10,890 (sq. ft.), 8 × 10,890 sq. ft. = 87,120 sq. ft., or 2 A. **7.** $4\frac{1}{2} \times \$90 = \$405$. **8.** (1) 75 × 110 = 8250 (sq. ft.), 8250 × \$200 = \$1,650,000; (2) 84 × 125 = 10,500 (sq. ft.), 10,500 × \$200 = \$2,100,000.

Page 275

Aim: To provide an oral review

Key: **1.** 78, 24, 41. **2.** 46, 26, 61. **3.** 43, 62, 19. **4.** 30, 71, 70. **5.** 150 ÷ 3 = 50 (yd.). **6.** 400, 114, 1960. **7.** 8 figures. **8.** $\frac{1}{2}$, $\frac{3}{4}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$. **9.** $1\frac{1}{2}$, $1\frac{1}{4}$, $2\frac{1}{3}$, $1\frac{3}{5}$, $4\frac{1}{2}$. **10.** $2\frac{1}{2} + 3\frac{1}{2} = 5\frac{2}{2} = 6$ (yd.). **11.** 12, 21, 24, 27, 33, 60. **12.** 15, 21, 30, 36, 60, 75. **13.** 1 million, 1 million 1, 1 million 2. **14.** 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56; 92, 96, 100, 104, 108. **15.** 37, 43, 49, 55, 61; 83, 89, 95, 101, 107, 113, 119. **16.** $\frac{6}{12}$, $\frac{2}{12}$, $\frac{3}{12}$, $\frac{4}{12}$. **17.** 12, 13, 14, 15, 25; 27, 28, 29, 30, 40, 50; 38, 39, 40, 50, $1.00. **19.** 9 sq. ft.; 72 ÷ 9 = 8 (sq. yd.). **20.** 4 pk. = 1 bu.; 60 lb. ÷ 4 = 15 lb.

Page 276

Aim: To review common geometric figures

Suggestions: Make this work as interesting as possible by having the pupils find in the schoolroom and out of doors as many things as they can that have the shapes of the figures on this page. They will easily find such illustrations of circles as wheels, coins, the full moon, the top of a glass, and so on. The method of using chalk and string to draw a circle on the blackboard, as suggested in ex. 2, will be of considerable interest.

Key: **1.** 10 circles. **5.** The first and the second. **6.** Yes.

Page 277

Aim: To review division, addition, multiplication, and subtraction of whole numbers, including dollars and cents

Key: **1.** 35; 11; 85; $630\frac{5}{21}$. **2.** $16\frac{1}{2}$; $30\frac{16}{29}$; $57\frac{13}{15}$; $431\frac{8}{19}$. **3.** 13; 68; 104; 679. **4.** 44; $10\frac{57}{80}$; $198\frac{5}{12}$; $719\frac{4}{27}$. **5.** $12\frac{6}{17}$; $19\frac{9}{14}$; $508\frac{1}{4}$; 854. **6.** 14; $14\frac{27}{47}$; 47; 922. **7.** 62; 18; $126\frac{63}{74}$; $794\frac{8}{9}$. **8.** 25,935; 48,574. **9.** 10,790; 134,332. **10.** 17,607; 51,451. **11.** 20,766; 90,401. **12.** 14,984; 66,101. **13.** 249,711; 324,478; 70,470; 863,838; 215,040; 376,200. **14.** 678,140; 111,360; 115,902; 176,529; 686,250; 706,500. **15.** $98.66; $199.01; $130.56; $92.77; $214.34. **16.** $47.85; $339.29; $467.64; $347.05; $498.88. **17.** $1246.24, $1318.53, $1040.08, $187.93, $1083.66; $362.01, $1410.15, $775.36, $1252.95, $1354.26.

Pages 278–280

Aim: To present simple scale drawings related to pupil interests

Suggestions: A knowledge of scale drawing enables one to read and draw maps and to draw plans of buildings. The exercises on page 278 should cause no difficulty, since a very simple scale of 1 in. = 1 mi. is used. This scale means that $\frac{1}{2}$ in. represents $\frac{1}{2}$ mi. and $\frac{1}{4}$ in. represents $\frac{1}{4}$ mi. If the pupils wish to find the distance from Bob's house to Don's house, caution them to measure along the vertical line, using the distance between the marks on that line. Since this distance is $\frac{3}{4}$ in., Bob's house is $\frac{3}{4}$ mi. from Don's house. A scale of 1 in. = 1 mi. is used also on page 279. On page 280, however, a different scale of 1 in. = 4 mi. is used. This scale means that $\frac{1}{4}$ in. represents 1 mi. Likewise, $\frac{3}{4}$ in. represents

3 mi. The work in ex. 2–7 on page 280 should not be done until ex. 1 is completely understood.

Key: **Page 278** **2.** 2 in.; 2 mi. **3.** $1\frac{1}{2}$ mi.; $2\frac{1}{4}$ mi.; $3\frac{1}{4}$ mi.; $4\frac{1}{4}$ mi. **4.** (1) $1\frac{1}{2}$ mi.; (2) 2 mi. + $1\frac{1}{2}$ mi. = $3\frac{1}{2}$ mi.; (3) $2\frac{3}{4}$ mi. + $1\frac{1}{2}$ mi. = $2\frac{3}{4}$ mi. + $1\frac{2}{4}$ mi. = $3\frac{5}{4}$ mi. = $4\frac{1}{4}$ mi. **6.** $2\frac{1}{2}$ mi.

Page 279 **1.** 2 mi. **2.** $\frac{1}{2}$ mi. **3.** (1) $1\frac{1}{2}$ mi.; (2) $2\frac{3}{4}$ mi.; (3) $\frac{1}{2}$ mi. + $1\frac{1}{2}$ mi. + $2\frac{3}{4}$ mi. = $4\frac{3}{4}$ mi. **4.** (1) 1 mi.; (2) $1\frac{1}{2}$ mi.; (3) 1 mi. + $1\frac{1}{2}$ mi. = $2\frac{1}{2}$ mi. **5.** $2\frac{1}{4}$ mi.; 4 mi. **6.** (1) 1 mi. + $1\frac{1}{2}$ mi. + 4 mi. = $6\frac{1}{2}$ mi.; (2) $6\frac{1}{2}$ mi. − $4\frac{3}{4}$ mi. = $5\frac{3}{2}$ mi. − $4\frac{3}{4}$ mi. = $5\frac{6}{4}$ mi. − $4\frac{3}{4}$ mi. = $1\frac{3}{4}$ mi.; (3) $6\frac{1}{2}$ mi. + $4\frac{3}{4}$ mi. = $6\frac{2}{4}$ mi. + $4\frac{3}{4}$ mi. = $10\frac{5}{4}$ mi. or $11\frac{1}{4}$ mi.

Page 280 **1.** 1 mi.; 2 mi.; 3 mi. **2.** 3 mi.; 6 mi. + 3 mi. = 9 mi. **3.** 6 mi.; 5 mi.; 11 mi.; 17 mi. **4.** 11 mi.; 14 mi.; 14 mi. − 11 mi. = 3 mi. **5.** Camp Sunshine to Long Pond is 5 mi., Long Pond to Blue Mountain is 8 mi., 5 mi. + 8 mi. = 13 mi.; Camp Rainbow to High Falls is 3 mi., High Falls to Blue Mountain is 6 mi., 3 mi. + 6 mi. = 9 mi.; 13 mi. − 9 mi. = 4 mi. (by shorter route). **6.** 1 mi.; 7 mi.

Page 281

Aim: To review basic concepts of measures

Suggestions: Choosing the correct unit of measure is an excellent way to evaluate basic understanding of measures. The work on this page is planned to help the teacher determine whether the class really understands measures. Pupils who are unable to indicate which measure to use in these exercises need much help in the basic understanding of measures. It means little for a pupil to be able to quote equivalents and make computations if he does not know when and under what conditions to use the different measures. *Understanding precedes learning.*

Key: **4.** Pound, ton, ounce. **5.** Second, year, hour. **6.** Inch. **7.** Hour. **8.** Ton. **9.** Ounce. **10.** Foot. **11.** Pound. **12.** Pound. **13.** Mile. **14.** Quart or gallon. **15.** Second. **16.** Month. **17.** Dozen or gross. **18.** Yard. **19.** Day.

Pages 282–283

Aim: To present problems dealing with cotton growing

Suggestions: Certain basic problem-solving skills are reviewed on these pages: rounding off large numbers, finding averages, computing elapsed time, and using measures of weight. Ex. 11 calls for research in a geography book, *The World Almanac*, or an encyclopedia.

Key: **1.** 6,945,000 bales. **2.** 7,000,000 bales. **3.** 200 ÷ 30 = $6\frac{2}{3}$ (mo.). **4.** September. **5.** Sept. 10. **6.** 400 lb. ÷ 8 = 50 lb. **7.** 129 lb. ÷ 2 = $64\frac{1}{2}$ lb., $64\frac{1}{2}$ lb. − 50 lb. = $14\frac{1}{2}$ lb. **8.** (1) 475 ÷ 1 = 475 (da.); (2) 475 ÷ 25 = 19 (mo.). **10.** (1) 500 lb. − 475 lb. = 25 lb.; (2) 25 ÷ 500 = $\frac{25}{500}$ = $\frac{1}{20}$; (3) 500 ÷ 2000 = $\frac{500}{2000}$ = $\frac{1}{4}$ (ton).

Pages 284–285

Aim: To give more work on scale drawing

Suggestions: The drawing on page 284 uses a scale of 1 in. = 2 mi. This means that $\frac{1}{2}$ in. equals 1 mi. In like manner, 2 in. equal 4 mi. and $2\frac{1}{2}$ in. equal 5 mi. Before proceeding with the work on page 284, give oral exercises with such questions as "How many miles are represented by $\frac{1}{2}$ in.? by $1\frac{1}{2}$ in.? by $2\frac{1}{2}$ in.?" and so on. The work on page 285 is really a study of different scales. In this work the pupils see that the actual length and width of an area depend upon the scale used.

Workbook Reference: Arithmetic Workshop, Book 5, pages 105 and 106

Key: Page 284 **1.** 3 in.; 3 × 2 mi. = 6 mi. **2.** (a) $1\frac{1}{2}$ in., $1\frac{1}{2} \times 2$ mi. = 3 mi.; (b) 4 in., 4 × 2 mi. = 8 mi.; (c) $1\frac{1}{2}$ in., $1\frac{1}{2} \times 2$ mi. = 3 mi. **3.** (1) $1\frac{1}{2}$ in. + $2\frac{1}{2}$ in. = 4 in., 4 × 2 mi. = 8 mi.; (2) 3 in. + $1\frac{1}{2}$ in. = $4\frac{1}{2}$ in., $4\frac{1}{2} \times 2$ mi. = 9 mi. **4.** $1\frac{1}{2}$ in. + 4 in. + 3 in. = $8\frac{1}{2}$ in., $8\frac{1}{2} \times 2$ mi. = 17 mi.

Page 285 **1.** 2 in. = 16 mi., 1 in. = 8 mi. **2.** (1) $1\frac{3}{4} \times 8$ mi. = 14 mi.; (2) $2\frac{1}{4} \times 8$ mi. = 18 mi.; (3) 2 × 8 mi. = 16 mi. **3.** (1) $\frac{1}{2} \times 8$ mi. = 4 mi.; $1\frac{1}{2} \times 8$ mi. = 12 mi.; $2\frac{1}{4} \times 8$ mi. = 18 mi.; $3\frac{3}{4} \times 8$ mi. = 30 mi.; (2) $\frac{1}{2} \times 20$ mi. = 10 mi.; $1\frac{1}{2} \times 20$ mi. = 30 mi.; $2\frac{1}{4} \times 20$ mi. = 45 mi.; $3\frac{3}{4} \times 20$ mi. = 75 mi.; (3) $\frac{1}{2} \times 12$ mi. = 6 mi.; $1\frac{1}{2} \times 12$ mi. = 18 mi.; $2\frac{1}{4} \times 12$ mi. = 27 mi.; $3\frac{3}{4} \times 12$ mi. = 45 mi. **6.** Jackson to Greenfield, 2 × 40 mi. = 80 mi.; Greenfield to Long Meadow, $1\frac{3}{4} \times 40$ mi. = 70 mi.; Long Meadow to Mayfield, $2\frac{1}{4} \times 40$ mi. = 90 mi.; Mayfield to Jackson, 2 × 40 mi. = 80 mi.

Pages 286–298

Aim: To provide end-of-the-year tests in all fundamental skills taught or retaught in Grade 5

Key: Page 286 **2.** 35, 86, 100, 63. **3.** 43, 23, 91, 51. **4.** 64, 51, 68, 37. **5.** 1339, 2298, 8211, 16,730, 7189; 1213, 2808, 11,427, 15,155, 7702. **6.** 304; 291; 345; 266; 460; 310; 400. **7.** 2829; 2623; 2910; 2938; 3429; 3530; 3000. **8.** 2707; 2504; 2348; 2712; 2757; 2308; 1997. **9.** \$1249.33. **10.** \$3011.20. **11.** \$1781.96. **12.** \$1576.10.

Page 287 **2.** 56, 23, 55, 32. **3.** 67, 32, 35, 34. **4.** 276; 4066; 52,958. **5.** 325; 3687; 16,797. **6.** 183; 1097; 26,826. **7.** 48; 2544; 39,694. **8.** 545; 548; 1919; 738; 811. **9.** 675; 842; 2973; 1283; 4130. **10.** See the answers for ex. 1, p. 19. **11.** 5733; 101,515; 31,995; 216,742. **12.** 2812; 85,680; 197,980; 34,572. **13.** 5184; 109,764; 392,700; 135,250. **14.** 2291; 176,589; 151,866; 554,798. **15.** 4489; 56,865; 779,516; 70,356. **16.** 6675; 188,232; 209,876; 707,000. **17.** 116,700; 37,500; 194,100; 88,200; 229,500. **18.** 373,950; 228,150; 415,800; 291,600; 176,400. **19.** 147,496; 62,830; 174,894; 55,620; 120,716.

Page 288 **1.** 75¢ ÷ 5¢ = 15 (pencils). **2.** 2 × 89¢ = 178¢ or \$1.78, $5\frac{1}{2} \times 60$¢ = 330¢ or \$3.30, \$1.78 + \$3.30 = \$5.08. **3.** \$6.75 + \$3.00 = \$9.75, \$17.93 − \$9.75 = \$8.18. **4.** $56\frac{3}{4}$ in. − $2\frac{3}{4}$ in. = 54 in. **5.** 24 mi. + 19 mi. + 17 mi. + 20 mi. = 80 mi., 80 mi. ÷ 4 = 20 mi. **6.** \$7.80 = 780¢, 780¢ ÷ 65¢ = 12 (wk.).

7. 209 mi. ÷ 38 mi. = $5\frac{19}{38}$ or $5\frac{1}{2}$ (hr.). **8.** \$.65 + \$.45 = \$1.10. **9.** \$2.60 + \$.72 + \$.10 = \$3.42, \$3.42 ÷ 9 = \$.38. **10.** \$15.00 = 1500¢, 1500¢ ÷ 25¢ = 60 (tickets Mary sold); \$13.00 = 1300¢, 1300¢ ÷ 25¢ = 52 (tickets Don sold).

Page 289 **2.** 63, 60, 91, 9 R1, 7 R1, 9 R1. **3.** 132, 31, 82, 6 R1, 7 R1, 8 R3. **4.** 70, 72, 70, 6 R1, 8 R2, 4 R3. **5.** 278; 323; 459. **6.** 189 R3; 593; 960 R39. **7.** 982 R11; 760 R36; 347 R7. **8.** 496; 812 R10; 402. **9.** 578; 653; 638. **10.** 28 R31; 46; 68; 73; 95. **11.** 37; 64; 81 R6; 87; 94. **12.** 30 R11; 93; 203 R13; 78; 314. **13.** $36\frac{2}{3}$; $35\frac{1}{2}$; 79; $82\frac{11}{90}$; 837. **14.** $98\frac{1}{5}$; 259; $67\frac{4}{9}$; 126; $859\frac{50}{63}$. **15.** 364; $70\frac{1}{2}$; 27; 95; 705. **16.** \$74.50 ÷ 25 = \$2.98. **17.** \$107.40 ÷ 12 = \$8.95. **18.** 1190¢ ÷ 5¢ = 238 (papers).

Page 290 **1.** $\frac{4}{5}$; $6\frac{1}{3}$; $9\frac{1}{2}$; $7\frac{1}{8}$; $15\frac{1}{12}$; $7\frac{1}{5}$. **2.** $1\frac{5}{8}$; 8; $15\frac{1}{6}$; $13\frac{1}{10}$; $17\frac{2}{3}$; $14\frac{13}{16}$. **3.** $\frac{2}{3}$; $1\frac{1}{3}$; $\frac{1}{2}$; $\frac{3}{10}$; $1\frac{3}{4}$; $2\frac{9}{16}$. **4.** $\frac{1}{3}$; $1\frac{1}{2}$; $2\frac{7}{12}$; $2\frac{3}{8}$; $1\frac{9}{10}$; $3\frac{7}{12}$. **5.** 1, $10\frac{2}{3}$, $4\frac{1}{6}$, $8\frac{1}{10}$, $17\frac{1}{12}$, $4\frac{11}{16}$; $\frac{2}{3}$, 10, $8\frac{1}{12}$, 7, $15\frac{1}{2}$, $11\frac{5}{12}$. **6.** 120; 184; 110; 63; 45; 198. **7.** 30; $\frac{1}{2}$; $\frac{7}{10}$; $7\frac{1}{12}$. **8.** 45; $\frac{1}{2}$; $\frac{3}{4}$; $9\frac{5}{8}$. **9.** 12; $\frac{2}{5}$; $3\frac{1}{2}$; 14. **10.** 12; $\frac{1}{2}$; $2\frac{1}{2}$; $8\frac{3}{4}$. **11.** $6\frac{3}{4}$ × \$.56 = \$3.78. **12.** $\frac{7}{8}$ × \$4.00 = \$3.50.

Page 291 **1.** 28¢ + 33¢ + 27¢ + 30¢ + 32¢ = 150¢, 150¢ ÷ 5 = 30¢. **2.** \$4.95 = 495¢, 495¢ ÷ 45¢ = 11 (wk.). **3.** 3864 mi. ÷ 7 = 552 mi. **4.** $\frac{3}{4}$ hr. = 45 min., 45 min. before 5:28 P.M. is 4:43 P.M. **5.** 42.03 in. − 37.22 in. = 4.81 in. **6.** $\frac{3}{4}$ × 60¢ = 45¢, 28¢ + 45¢ = 73¢ or \$.73, \$1.00 − \$.73 = \$.27. **7.** 13 × 42 mi. = 546 mi. **8.** 8 ft. + 13 ft. + 8 ft. + 13 ft. = 42 ft. **9.** $2\frac{1}{2}$ yd. + $1\frac{7}{8}$ yd. + $2\frac{1}{4}$ yd. = $2\frac{4}{8}$ yd. + $1\frac{7}{8}$ yd. + $2\frac{2}{8}$ yd. = $5\frac{13}{8}$ yd. = $6\frac{5}{8}$ yd.

Page 292 **1.** Yes. **2.** Yes. **3.** No; 3 mi. = 3 × 5280 ft. or 15,840 ft. **4.** Yes. **5.** No; the sum is 8. **6.** No; the product is 12,000. **7.** No; 1945. **8.** No; it is a mixed number. **9.** Yes. **10.** Yes. **11.** No; the first two equal $\frac{2}{3}$, but the last one equals $\frac{3}{4}$. **12.** Yes. **13.** Yes. **14.** No; 2 × 3 mi. = 6 mi. **15.** Yes. **16.** No; 15 ft. + 12 ft. + 15 ft. + 12 ft. = 54 ft. **17.** Yes. **18.** Yes. **19.** No; 43 yr. is nearer 4 decades. **20.** Yes.

Page 293 **1.** 6 = $\frac{1}{2}$ doz., $\frac{1}{2}$ × \$3.00 = \$1.50, \$1.60 + \$1.50 = \$3.10, \$3.10 ÷ 2 = \$1.55. **2.** $68\frac{1}{4}$ lb. − $43\frac{1}{2}$ lb. = $68\frac{1}{4}$ lb. − $43\frac{2}{4}$ lb. = $67\frac{5}{4}$ lb. − $43\frac{2}{4}$ lb. = $24\frac{3}{4}$ lb. **3.** 12 oz. = $\frac{12}{16}$ lb. or $\frac{3}{4}$ lb., $\frac{3}{4}$ × 76¢ = 57¢. **4.** 770 mi. ÷ 35 = 22 mi. **5.** \$55.97 ÷ 29 = \$1.93. **6.** 23 × 18 mi. = 414 mi. **7.** 560 mi. − 320 mi. = 240 mi. **8.** 12 ft. × 12 ft. = 144 sq. ft., 8 ft. × 16 ft. = 128 sq. ft.; 144 sq. ft. − 128 sq. ft. = 16 sq. ft.; Jack's yard has an area 16 sq. ft. larger. **9.** $\frac{5}{8}$ lb. + $\frac{1}{2}$ lb. = $\frac{5}{8}$ lb. + $\frac{4}{8}$ lb. = $\frac{9}{8}$ lb. = $1\frac{1}{8}$ lb. **10.** $21\frac{1}{2}$ sec. − $19\frac{3}{5}$ sec. = $21\frac{5}{10}$ sec. − $19\frac{6}{10}$ sec. = $20\frac{15}{10}$ sec. − $19\frac{6}{10}$ sec. = $1\frac{9}{10}$ sec. **11.** 2 lb. 7 oz. = $2\frac{7}{16}$ lb., $2\frac{7}{16}$ × 64¢ = 156¢ or \$1.56.

Page 294 **1.** 319.4. **2.** 158.07. **3.** .7; 4.8; .37; 7.25; 6.07; 9.22; 4.85. **4.** 173.1; 1158.1. **5.** 19.85; 111.66. **6.** 28.38; 37.16. **7.** 306.7; 872.9. **8.** 75.8 mi. + 75.8 mi. = 151.6 mi. **9.** 25.3¢ − 23.8¢ = 1.5¢. **10.** 1.74 in. + 2.08 in. = 3.82 in. **11.** 2.5; 13.5; 5.15; 59.87; 98.1; 27.66. **12.** 4.2; 30.8; .16; 27.59; 249.3; 24.09. **13.** 4.7; 17.6; .46; 42.75; 465.4; 23.38. **14.** 15.9, 110.5, 14.51, 110.81, 191.9, 81.58; 6.0, 82.2, 7.24, 54.97, 1164.1, 143.41; 14.5, 89.0, 5.82, 77.21, 1185.0, 91.36.

Page 295 **1.** $11.00 − $8.25 = $2.75. **2.** $5400 ÷ 12 = $450. **3.** 5 half dollars = $2.50, 9 quarters = $2.25, 15 dimes = $1.50, 22 nickels = $1.10, $2.50 + $2.25 + $1.50 + $1.10 = $7.35. **4.** 64 lb. − $8\frac{3}{4}$ lb. = $63\frac{4}{4}$ lb. − $8\frac{3}{4}$ lb. = $55\frac{1}{4}$ lb. **5.** 5 lb. 9 oz. = $5\frac{9}{16}$ lb., $5\frac{9}{16} \times 64¢$ = 356¢ or $3.56. **6.** 16 ft. × 24 ft. = 384 sq. ft. **7.** March has 31 days, $16.45 ÷ 31 = $.53 R2¢, or about $.53. **8.** 210 ÷ 12 = $17\frac{1}{2}$ (doz.), $17\frac{1}{2} \times \$.50$ = $8.75, $8.75 − $6.25 = $2.50. **9.** 4 × 12¢ = 48¢, $\frac{2}{3} \times 24¢$ = 16¢, 8 oz. = $\frac{1}{2}$ lb., $\frac{1}{2} \times 88¢$ = 44¢, 48¢ + 16¢ + 44¢ + 19¢ = 127¢ or $1.27. **10.** $3.00 = 300¢, 300¢ ÷ 15¢ = 20 (plants); 300¢ ÷ 12¢ = 25 (plants).

Page 296 **9.** 9 ft. + 12 ft. + 9 ft. + 12 ft. = 42 ft. **10.** 9 ft. × 12 ft. = 108 sq. ft. **11.** 18 in. × 18 in. = 324 sq. in. **12.** 18 in. + 18 in. + 18 in. + 18 in. = 72 in. **13.** $\frac{9}{7}$. **14.** 26 + 18 + 17 + 31 + 28 = 120, 120 ÷ 5 = 24. **15.** "12 yr." and "13 yr." not needed; 96 lb. − 80 lb. = 16 lb. **16.** "16 lb." not needed; April has 30 days, 30 ÷ 2 = 15 (cans). **17.** "3 hr.," "2 hr.," and "3 hr." not needed; 18 mi. + 10 mi. + 11 mi. = 39 mi. **18.** "$3\frac{1}{2}$-pound" not needed; $5.00 − $2.88 = $2.12. **19.** "32 children" not needed; 8 × 46¢ = 368¢ or $3.68.

Page 297 **1.** 45 min. + 50 min. + 40 min. + 35 min. + 40 min. = 210 min., 210 ÷ 60 = $3\frac{1}{2}$ (hr.). **2.** 9 mo. = $\frac{9}{12}$ yr. or $\frac{3}{4}$ yr. **3.** (1) 105 ÷ 35 = 3 (letters); (2) 3 × 60 = 180 (letters). **4.** 1 bu. = 32 qt., $\frac{20}{32} = \frac{5}{8}$ (bu.). **5.** 8:56 A.M. to 9:00 A.M. is 4 min., 4 min. + 27 min. = 31 min. **6.** 5 ft. 4 in. = 64 in., 64 in. − 57 in. = 7 in.; Betty's brother is 7 in. taller. **7.** 12 ft. × 12 ft. = 144 sq. ft., 10 ft. × 14 ft. = 140 sq. ft.; 144 sq. ft. − 140 sq. ft. = 4 sq. ft.; Bill's garden has the larger area. **8.** 5 lb. 6 oz. = $5\frac{6}{16}$ lb. or $5\frac{3}{8}$ lb., $5\frac{3}{8} \times 48¢$ = 258¢ or $2.58. **9.** 90 ft. × 120 ft. = 10,800 sq. ft., 10,800 × $2 = $21,600. **10.** (1) 5280 ft.; (2) $2\frac{1}{2} \times 5280$ ft. = 13,200 ft.; (3) 5 mi. = 5 × 5280 ft. = 26,400 ft., $5\frac{1}{2} \times 5280$ ft. = 29,040 ft.; nearer $5\frac{1}{2}$ mi. **11.** 17 ft. + 27 ft. + 17 ft. + 27 ft. = 88 ft.; yes.

Page 299

Aim: To have pupils take a timed test

Key: **1.** 290; 390; 353; 415; 361; 441; 373; 337. **2.** 5537; 8240; 34,163; 2298. **3.** 19,788; 17,866; 38,180; 2449. **4.** 23,755; 17,624; 57,769; 15,097. **5.** 308,700; 92,167; 170,844; 116,928; 111,105. **6.** 328 R32; 825; 749 R11; 189. **7.** 496; 270 R10; 607; 551.

Page 300

Aim: To provide a comprehensive review

Key: **1.** 350 × $2.75 = $962.50. **2.** $93.36 ÷ 24 = $3.89. **3.** $\frac{3}{4} \times \$1.20 = \$.90$. **4.** Square. **5.** 15″ × 15″ = 225 sq. in.; 15″ + 15″ + 15″ + 15″ = 60″. **6.** 42; 50; 140; 85. **7.** 45; 70; 140; 361. **8.** $.75 + $1.35 + $1.75 + $2.50 + $2.25 + $3.10 = $11.70, $11.70 ÷ 6 = $1.95. **9.** 1178 mi. ÷ 19 = 62 mi. **10.** 3 ft. = 1 yd., 66 ft. = 22 yd., 1 × 22 = 22 (sq. yd.), 22 × $2.95 = $64.90. **11.** (1) 22′ + 10′ + 22′ + 10′ = 64′, 16′ + 16′ + 16′ + 16′ = 64′; yes; (2) 22 × 10 = 220 (sq. ft.), 16 × 16 = 256 (sq. ft.); 16′ × 16′ has the larger area. **12.** $11\frac{9}{43}$; $173\frac{9}{29}$; 84; 704; $523\frac{1}{2}$. **13.** $27\frac{2}{3}$; 282; 98; $627\frac{2}{17}$; 987. **14.** $23\frac{4}{41}$; 128; $94\frac{23}{88}$; 253; $785\frac{1}{4}$.

15. $22\frac{13}{19}$; $349\frac{14}{19}$; 97; 688; 364. **16.** $2\frac{3}{8} + 4\frac{1}{16} + 1\frac{3}{4} = 2\frac{6}{16} + 4\frac{1}{16} + 1\frac{12}{16} = 7\frac{19}{16} = 8\frac{3}{16}$; $5\frac{1}{3} - 3\frac{1}{2} = 5\frac{2}{6} - 3\frac{3}{6} = 4\frac{8}{6} - 3\frac{3}{6} = 1\frac{5}{6}$. **17.** $1\frac{5}{12} + 2\frac{2}{3} + 4\frac{1}{4} = 1\frac{5}{12} + 2\frac{8}{12} + 4\frac{3}{12} = 7\frac{16}{12} = 8\frac{4}{12} = 8\frac{1}{3}$; $9\frac{1}{4} - 4\frac{3}{4} = 8\frac{5}{4} - 4\frac{3}{4} = 4\frac{2}{4} = 4\frac{1}{2}$.

Page 301

Aim: To present Problem Test 8

Workbook Reference: Arithmetic Workshop, Book 5, page 113

Key: **1.** 2000 ÷ 35 = 57 R5, or 57 rows, 5 plants left over. **2.** 12 oz. = $\frac{12}{16}$ lb. = $\frac{3}{4}$ lb., $\frac{3}{4} \times \$1.80 = \$1.35$. **3.** \$3.75 + \$2.86 + \$3.32 + \$4.75 = \$14.68, \$14.68 ÷ 4 = \$3.67. **4.** 37 ft. × 29 ft. = 1073 sq. ft. **5.** $17\frac{1}{4}$ lb. − $14\frac{5}{8}$ lb. = $17\frac{2}{8}$ lb. − $14\frac{5}{8}$ lb. = $16\frac{10}{8}$ lb. − $14\frac{5}{8}$ lb. = $2\frac{5}{8}$ lb. **6.** \$4.00 − \$2.75 = \$1.25. **7.** $3\frac{1}{2} \times \$.88 = \$3.08$, \$5.00 − \$3.08 = \$1.92. **8.** 3750 mi. ÷ 15 = 250 mi. **9.** 20 × 72 = 1440 (pencils), 5¢ × 1440 = 7200¢ or \$72.00. **10.** \$6.96 ÷ 8 = \$.87.

Pages 302–303

Aim: To provide two pages of diagnostic tests with page references for those pupils who need additional help

Key: Page 302 **1.** 15.6; 12.19; 2.39; 117.26. **2.** 6.4; 45.7; 1.97; 33.78. **3.** 174,993; 563,325; 485,460; 140,624. **4.** 23; 41; 354. **5.** 38 R10; 56 R30; 678. **6.** 7 R27; 76; 767. **7.** 34 R9; 44 R32; 756 R13. **8.** 32; 62; 876. **9.** 30 R11; 180 R5; 590. **10.** 204; 307 R5; 907. **11.** 56 R7; 76; 975. **12.** 9 R31; 99 R23; 996 R37.

Page 303 **1.** $2\frac{4}{5}$; $6\frac{2}{3}$; $5\frac{1}{2}$; 11; $8\frac{3}{5}$. **2.** $1\frac{1}{8}$; $3\frac{5}{6}$; $10\frac{1}{16}$; $9\frac{1}{5}$; $9\frac{1}{6}$. **3.** $\frac{7}{8}$; 9; $13\frac{7}{16}$; $12\frac{3}{4}$; 13. **4.** $\frac{3}{4}$; $4\frac{1}{2}$; $1\frac{1}{2}$; $3\frac{4}{5}$; $2\frac{3}{8}$. **5.** $\frac{5}{8}$; $7\frac{1}{2}$; $1\frac{11}{16}$; $\frac{1}{4}$; $1\frac{1}{2}$. **6.** $\frac{1}{3}$; $1\frac{5}{8}$; $4\frac{1}{2}$; $2\frac{2}{5}$; $3\frac{1}{2}$. **7.** $1\frac{3}{8}$; $3\frac{3}{4}$; $4\frac{2}{3}$; $2\frac{3}{4}$; $\frac{1}{2}$. **8.** 14; 28; 24. **9.** 42; 30; 35. **10.** 63; 60; 243.

Page 304

Aim: To give an end-of-year test

Key: **1.** See the answers for ex. 1, p. 19. **2.** 13,812; 116,435; 206.76; $16\frac{5}{6}$; 14. **3.** 2368; 9843; 268.4; $1\frac{7}{16}$; $6\frac{5}{6}$. **4.** 188,480; 63; 100. **5.** 339,438; 48; 296. **6.** $216\frac{13}{32}$; 979; \$6.85; \$4.37. **7.** 14 ft. × 18 ft. = 252 sq. ft., 16 ft. × 16 ft. = 256 sq. ft., 256 sq. ft. − 252 sq. ft. = 4 sq. ft.; 16 ft. by 16 ft. is larger by 4 sq. ft. **8.** $2\frac{1}{2} \times \$.98 = \$2.45$, \$5.00 − \$2.45 = \$2.55. **9.** $\frac{3}{4}$ hr. + $1\frac{1}{4}$ hr. + 1 hr. = 3 hr., 3 hr. ÷ 3 = 1 hr. **10.** \$14.85 ÷ 33 = \$.45. **11.** 475 × \$1.25 = \$593.75.

Page 305

Aim: To present a ready-reference page of tables of measure

Pages 306–309

Aim: To provide a ready reference of the basic addition, subtraction, multiplication, and division facts

Suggestion: The facts are listed on these pages in sequential order so that pupils may see the relationships which exist between those facts. Be sure to point out the relationships.

Pages 310–326

Aim: To present additional practice pages

Suggestion: These pages are correlated with sections throughout the textbook. At the bottom of many of the text pages you will find a red circle with a white number that refers to a section of these practice pages.

Key: Page 310 **1.** 29; 36; 59; 97; 46. **2.** 70; 30; 80; 40; 80. **3.** 55; 41; 92; 34; 63. **4.** 26; 76; 52; 81; 92. **5.** 308; 254; 270; 236; 1824; 2000; 1655; 1841. **6.** 258; 236; 315; 306; 3073; 3073; 3230; 3526. **7.** 33; 50; 82; 63; 23. **8.** 45; 77; 83; 56; 22. **9.** 84; 55; 17; 23; 19. **10.** 36; 67; 48; 73; 28. **11.** 131; 32; 248; 258; 3789; 3670; 1856. **12.** 92; 221; 179; 1659; 4685; 796; 4884. **13.** 43; 95; 30; 347; 235; 3127; 7698. **14.** 592; 247; 164; 2589; 4409; 6567; 4159.

Page 311 **1.** 3 R2; 2 R4; 5 R5; 8 R2; 7 R3; 3 R4; 9 R6. **2.** 7 R5; 4 R3; 8 R5; 4 R4; 7 R3; 8 R6; 6 R3. **3.** 5 R5; 3 R7; 4 R4; 3 R7; 6 R4; 3 R2; 9 R5. **4.** 5 R3; 4 R2; 2 R5; 7 R7; 4 R2; 9 R5; 4 R5. **5.** 6 R1; 3 R3; 5 R7; 6 R3; 7 R5; 8 R4; 1 R5. **6.** 7 R5; 7 R4; 5 R5; 3 R4; 2 R5; 6 R5; 6 R6. **7.** 6 R6; 7 R6; 7 R3; 5 R4; 4 R3; 8 R2; 1 R5. **8.** 1 R7; 3 R3; 6 R7; 3 R2; 7 R1; 6 R3; 5 R1. **9.** 9 R2; 2 R6; 9 R4; 3 R6; 7 R5; 8 R8; 6 R5. **10.** 5877; 3128; 1934; 5040; 38,368; 19,050. **11.** 1752; 2448; 4640; 1345; 25,576; 37,576. **12.** 4375; 2496; 1043; 7443; 27,501; 9846. **13.** 134; 143 R5; 715; 483; 658 R1; 670 R5. **14.** 387 R1; 195; 934; 752; 529 R5; 496 R1. **15.** 209; 240 R3; 167; 896 R4; 283; 852. **16.** 235; 120 R4; 956; 438; 658; 807 R3.

Page 312 **1.** 92,645; 142,544; 47,367. **2.** 150,860; 270,840; 45,980. **3.** 133,687; 393,714; 378,432. **4.** 288,103; 565,326; 272,504. **5.** 527,100; 82,688; 325,622. **6.** 40,040; 259,929; 54,972. **7.** 763,705; 736,764; 240,768. **8.** 82,524; 137,264; 445,275. **9.** 1140; 2790; 56,000; 18,600. **10.** 2520; 2300; 27,200; 57,600. **11.** 3290; 780; 84,600; 40,500. **12.** 6570; 3600; 21,600; 4900. **13.** 1300; 2000; 15,600; 22,800. **14.** 4284; 348,075; 70,675; 396,397. **15.** 4095; 458,640; 355,625; 42,355. **16.** 4557; 181,826; 547,008; 486,324. **17.** 4464; 53,985; 102,678; 200,192. **18.** 7350; 339,669; 325,692; 548,856. **19.** 3060; 34,596; 364,496; 816,192. **20.** 1344; 674,707; 619,333; 54,375. **21.** 950; 149,952; 680,050; 826,918. **22.** 6177; 965,096; 339,416; 503,476. **23.** 3776; 154,963; 677,074; 526,812.

Page 313 **1.** 369,472; 522,040; 213,560. **2.** 788,620; 501,960; 310,590. **3.** 57,280; 362,475; 874,000. **4.** 764,536; 529,200; 492,102. **5.** 584,640; 341,741; 379,126. **6.** 227,115; 400,140; 48,360. **7.** 652,620; 106,914; 617,267. **8.** 2; 5; 9; 7. **9.** 4; 4; 6; 8. **10.** 2 R3; 5; 9; 8 R7. **11.** 4; 7; 8; 5. **12.** 4 R3; 6 R3; 7; 8. **13.** 3 R3; 6 R2; 8 R1; 5 R3. **14.** 2 R7; 7 R7; 9; 9. **15.** 3; 5 R5; 9; 6 R19. **16.** 43; 34; 93; 54. **17.** 32; 63; 27; 63. **18.** 35; 82; 26; 52. **19.** 33; 53; 84; 71. **20.** 43; 63; 93; 42. **21.** 31; 63; 52; 73. **22.** 24; 34; 61; 53. **23.** 31; 35; 74; 72.

Page 314 **1.** 36 R9; 62 R23; 81 R17; 57 R47. **2.** 37; 76 R29; 56; 58 R9. **3.** 26; 72 R17; 53 R26; 63 R6. **4.** 35 R12; 73 R17; 68 R26; 46 R31. **5.** 34 R5; 68 R13; 64 R60; 68 R32. **6.** 26 R27; 47; 45 R13; 85 R25. **7.** 18; 63 R37;

84 R38; 65 R11. **8.** $\frac{1}{4}; \frac{2}{5}; \frac{1}{5}; \frac{1}{5}; \frac{4}{5}; \frac{1}{8}; \frac{1}{8}; \frac{2}{3}; \frac{1}{4}$. **9.** $\frac{1}{5}; \frac{3}{4}; \frac{3}{8}; \frac{1}{2}; \frac{4}{5}; \frac{3}{4}; \frac{1}{3}; \frac{9}{10}; \frac{1}{2}$. **10.** $\frac{1}{2}; \frac{3}{5}; \frac{3}{4}; \frac{1}{4}; \frac{2}{3}; \frac{4}{5}; \frac{1}{2}; \frac{1}{2}; \frac{5}{8}$. **11.** $\frac{2}{3}; \frac{3}{4}; \frac{1}{2}; \frac{1}{2}; \frac{1}{8}; \frac{3}{4}; \frac{1}{2}; \frac{1}{4}$. **12.** $\frac{1}{2}; \frac{2}{3}; \frac{3}{4}; \frac{3}{8}; \frac{5}{8}; \frac{2}{3}; \frac{5}{6}; \frac{5}{12}$. **13.** $\frac{3}{4}; \frac{3}{7}; \frac{1}{3}; \frac{5}{6}; \frac{1}{2}; \frac{3}{4}; \frac{1}{2}; \frac{1}{2}$. **14.** $\frac{1}{2}; \frac{2}{3}; \frac{3}{4}; \frac{5}{8}; \frac{3}{4}; \frac{1}{4}; \frac{3}{4}; \frac{3}{5}$. **15.** $\frac{5}{7}; \frac{1}{2}; \frac{2}{3}; \frac{1}{2}; \frac{7}{8}; \frac{1}{3}; \frac{1}{2}; \frac{7}{8}$.

Page 315 **1.** $3\frac{4}{5}; 7\frac{1}{2}; 9\frac{2}{3}; 4\frac{2}{5}; 9\frac{2}{3}; 4\frac{7}{8}; 7\frac{4}{5}$. **2.** $5\frac{1}{2}; 10\frac{1}{4}; 6\frac{3}{4}; 7\frac{5}{8}; 6\frac{3}{5}; 8\frac{5}{6}; 6\frac{1}{2}$. **3.** $8\frac{3}{4}; 9\frac{4}{5}; 11\frac{1}{3}; 8\frac{1}{2}; 11\frac{3}{4}; 11\frac{1}{5}; 6\frac{1}{6}$. **4.** $9\frac{1}{2}; 5\frac{3}{4}; 10\frac{2}{5}; 9\frac{3}{5}; 8\frac{2}{3}; 10\frac{5}{8}; 7\frac{7}{8}$. **5.** $\frac{1}{4}; \frac{3}{5}; \frac{1}{2}; \frac{1}{2}; \frac{7}{8}; \frac{4}{5}; \frac{1}{3}; \frac{3}{8}$. **6.** $\frac{2}{3}; \frac{1}{2}; \frac{1}{5}; \frac{1}{2}; \frac{3}{5}; \frac{1}{3}; \frac{1}{4}; 0$. **7.** $\frac{1}{4}; \frac{1}{3}; \frac{3}{4}; \frac{2}{5}; \frac{1}{2}; \frac{1}{6}; \frac{3}{4}; \frac{1}{2}$. **8.** $\frac{2}{5}; \frac{1}{3}; \frac{1}{2}; \frac{5}{8}; \frac{5}{6}; \frac{1}{4}; \frac{1}{5}; \frac{3}{4}$. **9.** $3\frac{1}{2}; 1; 1\frac{1}{3}; 1\frac{5}{6}; 1; 2\frac{1}{10}; 24\frac{1}{2}; 2$. **10.** $2\frac{2}{3}; 1\frac{2}{5}; 1; 3\frac{3}{5}; 2\frac{1}{12}; 2\frac{3}{16}; 3; 3\frac{1}{2}$. **11.** $1\frac{1}{4}; 4; 1\frac{1}{2}; 1\frac{1}{2}; 4; 3; 3\frac{1}{3}; 2\frac{1}{2}$.

Page 316 **1.** $1; 1\frac{3}{5}; 1; 1\frac{1}{2}; 1\frac{5}{8}; 1\frac{3}{5}; 1\frac{1}{6}; 1$. **2.** $1\frac{3}{4}; 1; 1; 1; 1\frac{5}{6}; 1\frac{1}{8}; 1\frac{2}{5}; 1$. **3.** $1; 1\frac{1}{6}; 1\frac{1}{3}; 1; 1\frac{3}{8}; 1; 1\frac{1}{2}; 1\frac{1}{2}$. **4.** $1\frac{1}{4}; 1\frac{1}{2}; 1\frac{1}{4}; 1\frac{1}{5}; 1\frac{1}{3}; 1; 1\frac{1}{4}; 1\frac{1}{5}$. **5.** $11; 17; 9\frac{1}{8}; 7\frac{3}{5}; 9; 7\frac{1}{8}; 9$. **6.** $8\frac{1}{2}; 4\frac{2}{5}; 13; 10\frac{1}{4}; 12\frac{1}{3}; 11\frac{3}{5}; 16\frac{5}{6}$. **7.** $8\frac{2}{3}; 15\frac{1}{2}; 19; 8\frac{1}{5}; 6; 11\frac{1}{10}; 10\frac{1}{5}$. **8.** $15\frac{1}{4}; 10\frac{1}{3}; 8\frac{4}{5}; 13\frac{1}{2}; 10; 11; 11\frac{1}{6}$. **9.** $10\frac{3}{7}; 8; 7\frac{1}{3}; 5\frac{5}{8}; 18\frac{2}{5}; 9; 12$. **10.** $9; 17\frac{4}{9}; 7; 16\frac{1}{6}; 9\frac{5}{8}; 11; 14\frac{1}{3}$. **11.** $12\frac{1}{2}; 6\frac{1}{4}; 14\frac{1}{2}; 12; 10; 3\frac{3}{8}; 9$.

Page 317 **1.** 183,825; 218,664; 220,603; 200,000; 206,773. **2.** 168,856; 172,218; 347,166; 272,032; 142,908. **3.** 168,083; 152,426; 212,311; 267,726; 189,968. **4.** 78 R12; 58 R32; 75 R23; 45 R19. **5.** 98 R32; 64 R19; 64 R25; 34 R45. **6.** 94 R29; 59 R21; 79 R43; 83 R17. **7.** 54 R12; 57 R14; 58 R25; 46 R31. **8.** 627; 234 R31; 237. **9.** 467 R21; 523 R14; 349 R19. **10.** 568 R18; 435 R27; 856. **11.** 752 R17; 358 R32; 637. **12.** 734 R23; 964 R11; 893 R36. **13.** 462 R42; 346 R15; 265 R23. **14.** 365 R21; 543; 532 R32.

Page 318 **1.** 9; 7; 8 R2; 5; 7. **2.** 6; 9 R7; 5 R11; 8; 6. **3.** 7 R4; 6; 9; 8 R7; 9. **4.** 32; 92; 426 R7. **5.** 72; 62; 532. **6.** 82; 82; 425. **7.** 76; 53; 842. **8.** 65; 63; 821. **9.** 93; 92 R5; 623. **10.** 52; 83; 921. **11.** 370 R11; 450; 390. **12.** 120 R5; 890; 560 R25. **13.** 150 R35; 230; 240. **14.** 430 R7; 370 R13; 620. **15.** 170; 520 R27; 310. **16.** 250; 410; 720 R35. **17.** 240 R12; 570 R35; 830. **18.** 705 R13; 206 R3; 804. **19.** 503; 308; 603. **20.** 607; 706; 505 R11. **21.** 309; 904; 806. **22.** 406 R34; 509; 908.

Page 319 **1.** 47; 84 R7; 78; 98; 847. **2.** 34 R9; 85 R9; 273; 79 R11; 861. **3.** 46; 96; 94; 169; 967. **4.** 44; 67 R5; 325; 93; 932. **5.** 35 R11; 75; 73; 59; 742. **6.** 9 R27; 8 R18; 99 R28; 891; 887 R16. **7.** 9 R18; 9 R20; 91; 989 R19; 998 R22. **8.** 8 R31; 8 R17; 89; 999; 883. **9.** 9 R16; 9 R42; 96; 989; 989 R41. **10.** 9 R32; 9 R21; 87 R20; 989; 988. **11.** 8; 9 R22; 99 R40; 989; 899. **12.** 8 R42; 8 R15; 89; 890 R14; 892 R26. **13.** $\frac{1}{2}; \frac{7}{8}; \frac{7}{8}; \frac{13}{16}; \frac{11}{12}; \frac{15}{16}; \frac{3}{5}; \frac{11}{12}$. **14.** $\frac{5}{8}; \frac{5}{6}; \frac{3}{4}; \frac{7}{10}; \frac{7}{16}, \frac{7}{12}; \frac{13}{16}; \frac{13}{16}$. **15.** $\frac{2}{3}; \frac{7}{8}; \frac{3}{8}; \frac{11}{12}; \frac{7}{10}; \frac{5}{6}; \frac{3}{10}; \frac{9}{16}$.

Page 320 **1.** $1\frac{1}{3}; 1\frac{1}{8}; 1\frac{3}{8}; 1\frac{1}{4}; 1\frac{7}{16}; 1\frac{2}{5}; 1\frac{5}{16}; 1\frac{1}{10}$. **2.** $1\frac{1}{4}; 1\frac{1}{8}; 1\frac{1}{6}; 1\frac{3}{16}; 1\frac{3}{16}; 1\frac{1}{6}; 1\frac{1}{2}; 1\frac{5}{16}$. **3.** $1\frac{1}{2}; 1\frac{1}{8}; 1\frac{1}{3}; 1\frac{1}{5}; 1\frac{2}{3}; 1\frac{5}{16}; 1\frac{1}{4}; 1\frac{3}{10}$. **4.** $1\frac{1}{6}; 1\frac{1}{4}; 1\frac{5}{8}; 1\frac{1}{10}; 1\frac{1}{4}; 1\frac{1}{4}; 1\frac{1}{16}; 1\frac{7}{16}$. **5.** $7\frac{1}{4}; 13\frac{1}{2}; 11\frac{1}{4}; 8\frac{1}{5}; 11\frac{3}{16}; 10\frac{7}{12}; 8\frac{1}{2}$. **6.** $9\frac{1}{8}; 10\frac{1}{6}; 11\frac{3}{5}; 13\frac{9}{16}; 13\frac{1}{10}; 12\frac{13}{16}; 9\frac{1}{4}$. **7.** $12\frac{1}{3}; 5\frac{2}{3}; 11\frac{1}{4}; 8\frac{3}{10}; 12\frac{1}{12}; 11\frac{7}{16}; 12\frac{5}{12}$. **8.** $\frac{1}{8}; \frac{1}{6}; \frac{1}{16}; \frac{1}{3}; \frac{7}{16}; \frac{3}{10}; \frac{1}{4}; \frac{1}{10}; \frac{5}{16}$. **9.** $\frac{1}{8}; \frac{1}{8}; \frac{11}{16}; \frac{1}{2}; \frac{1}{4}; \frac{7}{16}; \frac{3}{16}; \frac{3}{4}; \frac{1}{5}$. **10.** $\frac{3}{8}; \frac{1}{3}; \frac{1}{12}; \frac{9}{16}; \frac{7}{10}; \frac{3}{4}; \frac{1}{2}; \frac{3}{16}; \frac{2}{3}$.

Page 321 **1.** $\frac{7}{10}; 1\frac{1}{6}; 6\frac{3}{10}; 6\frac{5}{6}; 8\frac{11}{12}; 3\frac{14}{15}; 10\frac{7}{12}$. **2.** $1\frac{5}{12}; \frac{9}{10}; 9\frac{13}{15}; 7\frac{1}{6}; 7\frac{13}{20}; 4\frac{9}{10}; 9\frac{9}{20}$. **3.** $\frac{1}{6}; \frac{11}{20}; 7\frac{5}{12}; 4\frac{2}{15}; 1\frac{7}{20}; 3\frac{1}{20}; 4\frac{1}{6}$. **4.** $\frac{11}{20}; \frac{1}{12}; 4\frac{3}{10}; 6\frac{1}{12}; 2\frac{1}{20}; 3\frac{5}{12}; 5\frac{1}{10}$. **5.** $\frac{4}{5}; \frac{1}{2}; \frac{1}{5}; \frac{1}{3}; \frac{7}{10}; \frac{7}{12}; \frac{11}{16}; \frac{1}{12}$. **6.** $\frac{3}{8}; \frac{1}{4}; \frac{7}{8}; \frac{3}{5}; \frac{7}{16}; \frac{3}{10}; \frac{11}{12}; \frac{5}{16}$. **7.** $5\frac{1}{2}; 1\frac{1}{4}; 3\frac{2}{3}; 1\frac{1}{10};$

$5\frac{11}{16}$; $\frac{5}{12}$; $1\frac{15}{16}$. **8.** $3\frac{3}{5}$; $7\frac{1}{8}$; $3\frac{3}{4}$; $\frac{5}{16}$; $2\frac{1}{12}$; $1\frac{3}{16}$; $1\frac{7}{10}$. **9.** $5\frac{1}{3}$; $2\frac{1}{6}$; $4\frac{2}{5}$; $\frac{7}{12}$; $3\frac{13}{16}$; $\frac{3}{10}$; $2\frac{9}{16}$. **10.** $8\frac{5}{6}$; $6\frac{1}{5}$; $2\frac{3}{8}$; $\frac{9}{10}$; $5\frac{1}{16}$; $2\frac{7}{16}$; $6\frac{11}{12}$.

Page 322 **1.** $6\frac{1}{2}$; $3\frac{3}{5}$; $2\frac{3}{8}$; $\frac{1}{6}$; $2\frac{4}{5}$; $1\frac{1}{2}$; $2\frac{2}{3}$. **2.** $1\frac{3}{5}$; $5\frac{3}{4}$; $\frac{3}{5}$; $\frac{1}{4}$; $3\frac{1}{2}$; $\frac{2}{5}$; $5\frac{3}{8}$. **3.** $3\frac{1}{2}$; $2\frac{3}{4}$; $4\frac{5}{6}$; $\frac{4}{5}$; $4\frac{3}{4}$; $5\frac{1}{5}$; $1\frac{7}{8}$. **4.** $2\frac{7}{8}$; $3\frac{1}{2}$; $1\frac{3}{4}$; $6\frac{5}{6}$; $\frac{1}{2}$; $3\frac{3}{5}$; $4\frac{7}{8}$. **5.** $7\frac{4}{5}$; $6\frac{5}{8}$; $2\frac{3}{4}$; $\frac{2}{3}$; $2\frac{1}{2}$; $\frac{1}{2}$; $1\frac{7}{8}$. **6.** $1\frac{1}{4}$; $2\frac{1}{2}$; $9\frac{1}{8}$; $10\frac{3}{10}$; $13\frac{1}{16}$; $11\frac{5}{12}$; $9\frac{3}{16}$. **7.** $2\frac{3}{8}$; 1; $11\frac{1}{3}$; $15\frac{3}{4}$; $15\frac{3}{5}$; $10\frac{1}{3}$; $10\frac{3}{4}$. **8.** $\frac{7}{8}$; 2; $17\frac{5}{8}$; $14\frac{4}{5}$; $10\frac{1}{4}$; $7\frac{9}{16}$; $8\frac{1}{5}$. **9.** $2\frac{1}{4}$; 9; 10.

Page 323 **1.** $4\frac{3}{4}$; $63\frac{5}{7}$; $96\frac{2}{3}$; $32\frac{4}{9}$. **2.** $39\frac{2}{5}$; $96\frac{1}{4}$; $38\frac{4}{7}$; $56\frac{3}{7}$. **3.** $21\frac{5}{17}$; $73\frac{2}{3}$; $74\frac{5}{6}$; $85\frac{2}{3}$. **4.** $15\frac{5}{6}$; $87\frac{3}{8}$; $49\frac{2}{7}$; $63\frac{3}{5}$. **5.** $1\frac{2}{3}$; $3\frac{11}{12}$; $3\frac{7}{10}$; $5\frac{11}{16}$; $\frac{3}{4}$; $2\frac{15}{16}$; $\frac{9}{10}$. **6.** $3\frac{3}{8}$; $1\frac{11}{16}$; $2\frac{2}{3}$; $7\frac{1}{2}$; $\frac{9}{16}$; $\frac{3}{5}$; $\frac{9}{16}$. **7.** $\frac{7}{8}$; $\frac{11}{16}$; $1\frac{5}{16}$; $1\frac{11}{12}$; $6\frac{7}{16}$; $3\frac{9}{10}$; $4\frac{5}{6}$. **8.** $2\frac{7}{8}$; $5\frac{3}{4}$; $1\frac{1}{2}$; $4\frac{7}{12}$; $1\frac{5}{16}$; $1\frac{13}{16}$; $2\frac{7}{10}$. **9.** $4\frac{1}{2}$; $1\frac{5}{8}$; $2\frac{3}{5}$; $\frac{13}{16}$; $2\frac{11}{12}$; $\frac{11}{16}$; $4\frac{7}{12}$. **10.** $5\frac{7}{8}$; $6\frac{3}{4}$; $1\frac{15}{16}$; $1\frac{1}{2}$; $2\frac{11}{12}$; $2\frac{13}{16}$; $2\frac{11}{16}$. **11.** $2\frac{2}{3}$; $3\frac{7}{8}$; $\frac{3}{4}$; $\frac{9}{16}$; $3\frac{5}{6}$; $1\frac{7}{10}$; $\frac{5}{16}$. **12.** $1\frac{5}{8}$; $1\frac{5}{6}$; $3\frac{9}{10}$; $2\frac{5}{12}$; $5\frac{11}{16}$; $3\frac{11}{12}$; $\frac{1}{2}$.

Page 324 **1.** 90; 198; 128; 186. **2.** 180; 150; 204; 168. **3.** 141; 205; 372; 119. **4.** 144; 76; 175; 455. **5.** 69; 250; 124; 630. **6.** 56; 64; 42; 155; 66. **7.** 45; 54; 21; 56; 136. **8.** 36; 25; 56; 126; 210. **9.** 77; 34; 40; 141; 200. **10.** 36; 63; 33; 140; 224. **11.** 12; 80; 30; 624; 185. **12.** 39; 49; 38; 147; 178. **13.** 57; 209; 1309; 294. **14.** 341; 108; 784; 1170. **15.** 438; 245; 954; 250. **16.** 189; 165; 1106; 456. **17.** 52; 209; 1178; 1026. **18.** 204; 357; 625; 640. **19.** 156; 248; 1407; 1073. **20.** 187; 136; 738; 391. **21.** 145; 204; 750; 2574.

Page 325 **1.** 11.2; 6.4; 8.6; 71.5; 13.9; 709.6. **2.** 12.1; 7.5; 62.8; 45.7; 130.7; 339.7. **3.** 1.7; 11.3; 65.3; 10.9; 0.7; 695.5. **4.** 12.3; 5.9; 49.3; 84.6; 25.9; 159.0. **5.** .37; 6.44; 4.82; 23.86; 16.93; 612.98. **6.** .28; 5.44; 8.60; 31.02; 64.41; 44.74. **7.** .51; 5.92; 0.22; 83.07; 20.07; 139.66. **8.** .38; 4.06; 1.38; 16.78; 3.46; 527.97. **9.** $1\frac{1}{8}$; $1\frac{1}{2}$; 161; $2\frac{1}{2}$. **10.** $\frac{2}{3}$; 84; $3\frac{5}{6}$; 3. **11.** 6; $2\frac{7}{16}$; $2\frac{3}{10}$; $3\frac{1}{3}$. **12.** $\frac{5}{12}$; 28; 8; 56. **13.** 4; $3\frac{3}{4}$; $2\frac{1}{8}$; 60. **14.** $1\frac{1}{2}$; $3\frac{9}{16}$; 152; $6\frac{7}{12}$.

Page 326 **1.** 20 ft. + 24 ft. + 20 ft. + 24 ft. = 88 ft.; 12 in. + 15 in. + 12 in. + 15 in. = 54 in.; 8 yd. + 15 yd. + 8 yd. + 15 yd. = 46 yd. **2.** 80 ft. + 95 ft. + 80 ft. + 95 ft. = 350 ft.; 22 in. + 25 in. + 22 in. + 25 in. = 94 in.; 5 yd. + 11 yd. + 5 yd. + 11 yd. = 32 yd. **3.** 62 ft. + 78 ft. + 62 ft. + 78 ft. = 280 ft.; 36 in. + 48 in. + 36 in. + 48 in. = 168 in.; 9 yd. + 20 yd. + 9 yd. + 20 yd. = 58 yd. **4.** 13 ft. + 19 ft. + 13 ft. + 19 ft. = 64 ft.; 25 in. + 40 in. + 25 in. + 40 in. = 130 in.; 4 yd. + 16 yd. + 4 yd. + 16 yd. = 40 yd. **5.** 25 ft. + 25 ft. + 25 ft. + 25 ft. = 100 ft.; 20 in. + 30 in. + 20 in. + 30 in. = 100 in.; 7 yd. + 19 yd. + 7 yd. + 19 yd. = 52 yd. **6.** 28 ft. + 32 ft. + 28 ft. + 32 ft. = 120 ft.; 15 in. + 42 in. + 15 in. + 42 in. = 114 in.; 3 yd. + 12 yd. + 3 yd. + 12 yd. = 30 yd. **7.** 2 ft. × 7 ft. = 14 sq. ft.; 11 ft. × 17 ft. = 187 sq. ft.; 30 ft. × 40 ft. = 1200 sq. ft. **8.** 4 ft. × 5 ft. = 20 sq. ft.; 14 ft. × 18 ft. = 252 sq. ft.; 35 ft. × 55 ft. = 1925 sq. ft. **9.** 9 ft. × 9 ft. = 81 sq. ft.; 15 ft. × 24 ft. = 360 sq. ft.; 40 ft. × 60 ft. = 2400 sq. ft. **10.** 5 ft. × 8 ft. = 40 sq. ft.; 18 ft. × 20 ft. = 360 sq. ft.; 46 ft. × 84 ft. = 3864 sq. ft. **11.** 7 ft. × 9 ft. = 63 sq. ft.; 10 ft. × 10 ft. = 100 sq. ft.; 20 ft. × 25 ft. = 500 sq. ft. **12.** 3 ft. × 8 ft. = 24 sq. ft.; 12 ft. × 18 ft. = 216 sq. ft.; 26 ft. × 38 ft. = 988 sq. ft. **13.** (1) 1 ft. = 12 in., 6 × 12 = 72 (sq. in.); (2) 2 ft. = 24 in., 5 × 24 = 120 (sq. in.); (3) 1 ft. 6 in. = 18 in., 9 × 18 = 162 (sq. in.). **14.** (1) 1 yd. = 36 in., 9 × 36 = 324 (sq. in.); (2) 1 ft. = 12 in., 4 × 12 = 48 (sq. in.); (3) 3 yd. 2 ft. = 11 ft., 5 × 11 = 55 (sq. ft.). **15.** (1) 3 yd. = 9 ft., 4 × 9 = 36 (sq. ft.); (2) 2 yd. = 6 ft., 2 × 6 = 12 (sq. ft.); (3) 2 ft. = 24 in., 2 ft. 7 in. = 31 in., 24 × 27 = 744 (sq. in.). **16.** (1) 6 yd. = 18 ft., 1 × 18 = 18 (sq. ft.); (2) 5 yd. = 15 ft., 1 × 15 = 15 (sq. ft.); (3) 1 yd. = 3 ft., 3 yd. 2 ft. = 11 ft., 3 × 11 = 33 (sq. ft.). **17.** (1) 4 yd. = 12 ft., 2 × 12 = 24 (sq. ft.); (2) 1 ft. = 12 in., 7 × 12 = 84 (sq. in.); (3) 1 ft. 2 in. = 14 in., 8 × 14 = 112 (sq. in.). **18.** (1) 2 ft. = 24 in., 8 × 24 = 192 (sq. in.); (2) 2 ft. = 24 in., 9 × 24 = 216 (sq. in.); (3) 1 ft. = 12 in., 1 ft. 9 in. = 21 in., 12 × 21 = 252 (sq. in.). **19.** (1) 4 ft. = 48 in., 9 × 48 = 432 (sq. in.); (2) 1 yd. = 36 in., 8 × 36 = 288 (sq. in.); (3) 1 yd. 1 ft. = 4 ft., 2 × 4 = 8 (sq. ft.).

Pages 327–329

Aim: To present "Suggestions to Teachers"

Instructional Materials

Learning Laboratories: The Learning Center, Inc., 53 Bank Street, Princeton, New Jersey, has developed several learning laboratories that can be used with *American Arithmetic, Grade 5.* These laboratories are available in class-size sets, so that each pupil can learn with his own three-dimensional materials at his own desk. With many of the laboratory sets listed below, The Learning Center supplies demonstration models and supplementary materials for the teacher. A Teacher's Manual accompanies each set of laboratories. Discovery sheets are provided for individual use by pupils.

K102 — *Patterns Boards* (Chap. 1, 7)
K104 — *Ten Tens Board* (Chap. 1)
K105 — *Number Line* (Chap. 1, 2)
K106 — *Colored Rods* (Chap. 1, 2)
K107 — *Time Learning* (Chap. 1, 3)
K108 — *Ones, Tens, Hundreds* (Chap. 1, 2, 5, 6)
K109 — *Oriental Abaci* (Chap. 1, 5)
K111 — *Magnetic Board* (Chap. 1)
K112 — *Base and Place* (Chap. 1, 2, 6)
K115 — *Simple Fractions* (Chap. 2, 4)
K117 — *Advanced Fractions* (Chap. 2, 4, 6)
K118 — *Fraction Equivalence* (Chap. 2, 4, 6)
K120 — *Linear Measurement* (Chap. 1, 8)
K130 — *Area Measurement* (Chap. 8)
K132 — *Perimeter* (Chap. 8)
K140 — *Geometry* (Chap. 8)
K168 — *Community Mapping* (Chap. 8)

Films: The following films are 16 mm. motion pictures and are listed alphabetically according to producer or distributor. A request for further information will usually bring excellent material concerning the objectives of the film, its cost, and its nearest point of distribution.

Coronet Instructional Films, 65 East South Water Street, Chicago 1, Illinois.

Multiplication Is Easy
Division Is Easy
We Discover Fractions
Decimals Are Easy
Story of Our Money System, The
Measurement

Encyclopaedia Britannica Films, Inc., 1150 Wilmette Avenue, Wilmette, Illinois.

Meaning of Long Division
The Number System
Meaning of Plus and Minus
What Are Fractions?
Weights and Measures

Johnson Hunt Productions, Film Center, La Cañada, California.

Introduction to Fractions
How to Change Fractions

Knowledge Builders, Visual Education Building, Floral Park, New York.

Simple Fractions

Text-Film Department, McGraw-Hill Book Company, Inc., 330 West 42 Street, New York 36, New York.

Parts of Things

Filmstrips: You should communicate directly with the producer or distributor listed below before ordering these filmstrips. The sales information which you will receive will assist you in determining the effectiveness of these filmstrips for your particular classroom. The names of the distributors and producers are alphabetized.

Curriculum Films, Inc., Curriculum Materials Corp., 1319 Vine Street, Philadelphia 7, Pennsylvania

What Is a Fraction?
How Large Is a Fraction?
Fractions of a Group
Writing Fractions

Filmstrip House, 347 Madison Avenue, New York 17, New York.

What Is a Fraction?
Adding with Fractions

Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan.

Multiplication and Division
Fractional Parts of a Whole, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$
Fractional Parts of Groups, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$
Fractional Parts of a Whole and Groups, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{8}$
Comparing Fractions
Non-unit Fractions of a Whole and Groups

Text-Film Department, McGraw-Hill Book Company, Inc., 330 West 42 Street, New York 36, New York.

Zero in Multiplication
Two Figure Divisors
History of Our Number System
History of Telling Time
History of Our Calendar

Charts, Devices, Games: There are numerous companies which specialize in devices. They will be pleased to send their catalogues upon request. Some of these companies are:

Milton Bradley Company, 74 Park Street, Springfield 2, Massachusetts
J. L. Hammett Company, Kendall Square, Cambridge 42, Massachusetts
The Judy Company, 310 North Second Street, Minneapolis, Minnesota
Holt, Rinehart and Winston, 383 Madison Avenue, New York 17, New York

Some of the specific charts and devices for use at this grade level are listed below. The names of the distributors are arranged alphabetically.

Hamilton Watch Co., Educational Service Dept., Lancaster, Pennsylvania.

Time Telling Chart

Ideal School Supply Company, 8316 S. Birkhoff Ave., Chicago 20, Illinois.

Fraction Wheel
Fractions Made Easy

F. A. Owen Publishing Company, Dansville, New York.

Charts on: *Measures I and II*
Change for a Dollar
Liquid & Dry Measure
Roman Numerals
Weight
Fraction Chart
A Long Division Chart

Robinson Howell Co., 641 Mission St., San Francisco 5, California.

Fraction Trainers

The Steck Company, Box 16, Austin 61, Texas.

Ten fraction cards showing $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ pictured in circles, squares, and triangles

Visual Specialities Co., 5701 West Vernor Street, Detroit, Michigan.

Fraction parts — felt cutouts

Holt, Rinehart and Winston, 383 Madison Avenue, New York 17, New York.

Number as a Child Sees It

Remedial-Special Instructional: *Ready Arithmetic Review* — Dana and Company, Box 201, Barrington, Rhode Island — a series of 40 self-correcting arithmetic cards which have been scientifically developed. A Teacher's Manual explains the proper use of these cards, and a pupil score card is included.

Tricks and Puzzles: Children enjoy puzzles and tricks. Suggest to the pupils that they bring to class many more of these tricks and puzzles. A scrapbook can easily be constructed. (Be sure to include the solutions to the puzzles at some point in the book.)

1. How much is $(5 + 5 + 5) \times 5 \times 5 \times (5 - 5)$? (*Ans.* 0, since any number multiplied by zero equals zero.)
2. If it takes 1 minute to make each cut, how long will it take to cut a sixteen-foot pole into sixteen equal pieces? (*Ans.* 15 minutes, since 15 cuts make 16 equal pieces.)

3. See whether you can figure out a way to take 1 from 29 and have 30 left. There is a little bit of a catch to this one. (*Ans.* This puzzle refers to Roman numerals. Take the I from XXIX and you have XXX or 30.)

4. Combine 4 fives (5, 5, 5, 5) so that the value they represent will be 56. (*Ans.* $55\frac{5}{5}$)

5. A boy bought a baseball and a bat for $2.50. He paid 50¢ more for the bat than he did for the ball. How much did he pay for each article? (*Ans.* The bat cost $1.50; the ball, $1.00.)

6. A snail starts at the bottom of a well which is 18 feet deep. Each day he climbs up 3 feet and each night he slides back 2 feet. How long will it take the snail to reach the top of the well? (*Ans.* 16 days. At the end of fifteen days, the snail has climbed 15 feet. On the sixteenth day he will climb 3 feet and thus reach the top of the well.)

7. In some places in the desert, water is scarce and is sold by the bottle. But bottles are also very scarce; in fact, they are more difficult to locate than water. Sometimes a traveler reports that he pays $1.00 more for the bottle than he does for the water, and that he pays $1.18 for a full bottle of water. How much does he pay for the water, and how much for the bottle? (*Ans.* The bottle costs $1.09; the water, $.09.)

8. If 6 cats kill 6 rats in 6 minutes, how long will it take 50 cats to kill 50 rats? (*Ans.* 6 minutes, since that is how long it takes 1 cat to kill 1 rat.)

9. What number is as much greater than 36 as it is less than 94? (*Ans.* 65. The difference between the two numbers is 58, and half of that is 29. $36 + 29 = 65$; $94 - 29 = 65$)

10. Which is more, a half-dozen dozen or six dozen dozen? (*Ans.* Six dozen dozen. A half-dozen dozen is 6 dozen or 72; 6 dozen dozen is 72 dozen or 864.)

11. Study the following example carefully:

    $(4 + 9) - (1 \times 2) = 11$

    In each of the following, use parentheses and the symbols +, −, and × to make the answer correct:

8	4	9	7 =	24	*Ans.* $(8 + 4) \times (9 - 7)$
9	5	6	8 =	31	*Ans.* $9 + (5 \times 6) - 8$
5	6	2	8 =	14	*Ans.* $(5 \times 6) - (2 \times 8)$
7	7	7	7 =	63	*Ans.* $7 + 7 + (7 \times 7)$
5	5	5	5 =	100	*Ans.* $(5 + 5) \times (5 + 5)$
8	6	6	6 =	24	*Ans.* $(8 - 6) \times (6 + 6)$

12. I can tell you in which month you were born and how old you are. Just follow my directions:

    1. Think of the month you were born. If it is January call it 1; if February, 2; if December, 12.

2. DO NOT TELL ME THIS NUMBER, but multiply it by 2; add 5, and then multiply by 50. DO NOT TELL ME THIS NUMBER.
3. Now add your age, subtract 365, and add 115.
4. WHAT NUMBER DO YOU GET? TELL ME.

(An answer like 1240 means that the person is 40 years old and was born in the twelfth month, or December; 625 means he is 25 years old and was born in June; 206 means he is 6 years old and was born in February.)

13. Write a secret number on a piece of paper, and don't show it to anyone. Then multiply your number by 2, add 10, divide by 2, and subtract the number you started with. Now compare your answer with those of the other pupils. (If no one makes a mistake, everyone will have the answer 5.)

14. Can you make 6 out of three toothpicks? You cannot break or bend the toothpicks. (*Ans.* V I)

15. Can you make 9 out of three toothpicks? (*Ans.* I X)

16. Try this number trick on a friend: "Write a high number on a piece of paper. Now write another number underneath it. I will write the third number in the column. You write the fourth, and I will write the fifth number. I can tell you the sum of these numbers at once."

Suppose the friend wrote the numbers....	6748254
	3582196
You would write as the third number.....	6417803
He would write another number.........	4263871
You would write the number............	5736128
You know immediately that the sum is...	26748252

(Explanation: When you write the third number, use numbers which complete the sum of 9 with the figures directly above in the second number. Do the same when writing the fifth number. Now the answer must be the same as the first number in the column except that 2 is subtracted from the ones place of the top number, and a 2 is placed in front of the top number.)

17. Have a person give you a 3-figure number in which none of the figures is alike. Now reverse the order of the figures and subtract the smaller number from the larger number. The middle figure will always be 9. Also, if you add the first and last figures together, the sum will be 9.

18. Have a person write down any number of two figures or more. Now reverse the figures of this number and subtract the smaller number from the larger. The difference obtained will always have as the sum of its figures a number that can be divided by 9.

(Explanation:

If the person writes.....	5 2 6 7 1
You write..............	1 7 6 2 5
Subtract...............	3 5 0 4 6

Add figures of difference 3 + 5 + 0 + 4 + 6 = 18; 18 can be divided by 9.)

19. Write down any number; double it; add a number to it; divide the result by 2; subtract the original number from the quotient; your answer will be $\frac{1}{2}$ of the number you added.

Illustrations

37	....Take a number..........	468
×2	....Multiply by 2...........	×2
74		936
+83	....Add any number.........	+28
157		964
$78\frac{1}{2}$	....Divide by 2.............	482
−37	....Subtract original number.	−468
$41\frac{1}{2}$	....You get................	14

The answer is $\frac{1}{2}$ of the number you originally added.

20. A boy starts working at a gasoline filling station. He says that he will take $1 for the first day's work, $2 for the second day's work, and so on for a month. How much will he earn at the end of 30 days? (*Ans.* $465.00)

Games: 1. Who Are My Brothers?

This game can be used most successfully in reviewing multiplication or division facts. A pupil goes to the front of the class and says:

I am (gives a number that can be factored; *e.g.*, 24).
Who is my family?

Children then take turns in giving factors of 24, such as 3 and 8, 2 and 12, 4 and 6, 2 and 2 and 2 and 3, and so on. Set a time limit on answers. If a pupil can suggest a number which the class cannot factor, he scores 1 point.

2. Relay Race

Divide the class into teams. Place basic flash cards in piles on a table at the front of the room. Each team has its own set of cards. Have the first pupil on each team walk to the front of the room, take a card from the pile, proceed to the blackboard, and place his card on the chalk tray. As he places the card on the chalk tray, so that the class can see it, he must give the answer. If he is wrong, ring a bell and have the pupil take the card to the "study line." Then have the next team member start forward. When each member of the team has completed one turn, the team with the most cards on the chalk tray wins the round.

Class-Constructed Teaching Aids: Many excellent teaching aids may be constructed through teacher-pupil planning and activities. Very often a pupil who is having difficulty with a certain concept in arithmetic will clarify his thinking by constructing a teaching aid on this particular topic. The most common and useful teaching aid is the Help-Me Card. However, many class teaching aids are also helpful. A few such items are listed on page 112.

1. Help-Me Card

Take a piece of heavy cardboard or oaktag about 2″ × 5″ in size. If the pupil does not know 3 + 6, he makes his card as shown:

One side $\boxed{\begin{array}{r}3\\ \underline{+6}\end{array}}$ Other side $\boxed{\begin{array}{r}3\\ \underline{+6}\\ 9\end{array}}$

2. Sorting the Mail

On a table at the front of the room, place ten shoe boxes labeled 0 to 9 respectively. Place a pile of flash cards face down in front of each box. These cards should contain the basic even and uneven division facts. A pupil comes to the front of the room and is given twenty cards. It is his job to sort these cards into the correct boxes. If his card says $7\overline{)28}$, he should place it in the 4 box. If his card says $8\overline{)58}$, he should place it in the 7 box (an uneven division fact). If his card says $3\overline{)2}$, he should place it in the 0 box. This game should be kept on a learning rather than a competing basis. After a pupil has finished sorting "the mail," an inspector will check his work. The pupil is scored by the inspector.

3. Park Your Car

Sketch a large parking lot on a piece of drawing paper 3′ × 4′. Show streets and spaces to park cars. Number the spaces with products from the multiplication table. Provide cars to park. (These cars can be real plastic cars or pieces of paper.) Each car should be labeled 4 × 6, 8 × 3, 9 × 2, and so on. Each pupil must park his car in the proper place; *i.e.*, the 4 × 6 car must be placed in lot 24, and so on. If car 3 × 8 is to be parked, it must be left on the street. The team that has the greatest number of cars parked at the end of a set time wins the game.

4. An Apple Tree

Sketch a large tree on a piece of white drawing (construction) paper. Make slots on the branches and insert pictures of apples with stems. On the back of each apple write a multiplication or a division combination. As a pupil "picks" the apple from the tree, he gives the correct answer. If he doesn't give the correct answer, he must replace the apple and sit down. The team with the most pupils standing after one turn wins the game.

Oranges can be substituted for apples. Leaves also might be used, and in the fall of the year a very colorful tree can be developed.

5. Wheel of Chance

Make a large wheel on white construction paper, placing numbers 0 through 9 on the circumference. Cut out an arrow with a slit at the tip for insertion of different numbers. Attach the arrow to the center of the circle so that it can be spun. Each child should spin the arrow; and if the number on the arrow is 4 and the arrow points to 7, the pupil says, "28." Each child should keep a bar graph showing the number of correct answers for each game played.

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